NOV 24 1891

THE AMERICAN GAS LIGHT JOURNAL

ROMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LV.—No. 21. Whole No. 859. | NEW YORK, MONDAY, NOVEMBER 23, 1891. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, N. Y.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Remittances should be made either by post-office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

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BRIEFLY TOLD.

THE END OF THE PROCEEDINGS.—With this number we conclude our report of the proceedings of the last meeting of the American Association, and in the current installment is the paper by Mr. Rollin Norris, of Philadelphia, on the "Theoretical Effect of Preheating Blast Steam and Oil in Water Gas Manufacture." The paper is one that cannot be dismissed in summary fashion, for, being almost entirely based on hypothesis, the mass of figures and their possible teaching must be carefully gone over so that the probability of "personal error" in one's conclusions may be reduced to a minimum. Referring to one practical deduction of Mr. Norris—that found where he says: "That is, with the steam raised to the very highest possible temperature, the total direct saving would be only a little over half a pound of coal per 1,000; and with the steam raised to, say, 800°, which is probably as much as we could practically count on, the saving would only amount to about one quarter of a pound of coal per 1,000"—we have record in this office of the practical working of two sets of water gas apparatus, constructed at the works of the Chicago Gas Light Company, in 1886. The sets, which were placed side by side, each calculated to produce 1,000,000 cubic feet in 24 hours, were operated, one with and the other without the superheating device, for the space of six months, under the competent direction of the late Mr. Forstall, and his report was that a net saving of one pound of coal per 1,000 cubic feet of gas made resulted from the practice of superheating the steam. In his opinion the gain was sufficient to cause him to remodel the set not adapted for steam superheating, to that state, and we understand that both sets are working to-day, and have since been working on a like plan. Mr. Norris's paper will command much attention, and he deserves great compliment for the precise manner in which his calculations are carried out, for, it is almost needless to remark, these involved the expenditure of much time and thought in their preparation.

The appointment of a new Committee on Gas Exhibits at the World's Fair is a guarantee that the manufacturers of gas apparatus will have a leading voice in the matter that concerns them most—unless, indeed, it be that the interests of the Chicago Gas Light Companies are paramount. One cannot blink the fact that the greatest permanent gain from the better education of the visitors to the Fair in the matter of the uses to which gas can be applied must accrue to the local gas companies. For instance, at the last Paris Exhibition, a gas pavilion was a feature of the buildings, and when the proposition was mooted to establish that building, it was suggested that all the gas companies of France contribute, in accordance with their magnitude, to its erection and equipment. How general the subscription was we cannot say, but we do know that at the outset a fund of perhaps 100,000 francs (about $20,000) was guaranteed, of which amount the Paris Gas Company subscribed 80 per cent. What the total sum subscribed was we cannot say either, but we do know that in the annual report of the Paris Company's operations for the year ended December 31, 1889 (the year in which the Exhibition was held) a charge is made, under the head of Expenses of General Management, of $52,000 for expenses incurred in connection with the Universal Exhibition. So it is fair to presume that the original subscription of $20,000 was found to be totally inadequate when the work was well underway. On the other hand we find that the 1889 increase in the Company's sendout over the year ending December 31, 1888, was 514,000,000 cubic feet, the total sendout for the year having been, 11,023,000,000 cubic feet. The Directors admitted that this was largely due to the Exhibition, and they also said that it (the increase) enabled them to make a better return to the shareholders than had been made for some years, besides permitting them to pay something, in fact, everything, on account of exceptional expenditures incurred in funding or liquidating certain debts of the Company. This ought to be sufficient to show that the Paris Exhibition was a good thing for the Paris Gas Company, and that the expenditure of the $52,000 was not all in vain, both as to its moral and practical effect. Turning to the report of the Company for its working in 1890, we find further proof that the Exhibition was a good thing for the Company, in that the output was less by 155,000,000 than that of the preceding year, on a total output of 10,867,500,000 cubic feet. Analysis of the reports of the Company would seem to show that the average normal gain per year in sendout is 178,500,000 cubic feet, hence the Exhibition was worth to the Paris Gas Company not less than the profit on the sale of 345,500,000

cubic feet of gas. If a similar result, proportionately, of course, is to be written of Chicago, when the Fair shall have been closed, it would seem as though the Chicago Gas Companies should have spoken out long ago as to what they were willing to expend towards erecting a building in which gas and its possibilities might be exploited. To us it does not seem too late to yet accomplish this, but those at home ought in reason to tender the invitation, and preface it with a statement that they do not wish to devour all the banquet which others are willing to assist in preparing for their table. If the gas educational feature of the Fair is estimated to be worth $100 by Mr. Nettleton to his Company at Birmingham, Conn., then it ought to be worth to the Chicago Gas Companies not a cent less than $50,000. However, we shall see what we shall see.

The Question-Box this year was not very prolific of matter, but no doubt the perplexities of the executive, caused by illness, accounts for that. When all is said, we think it will be agreed on by those who have read the proceedings that the last meeting of the American Association was a notable one.

JUDGE JACKSON'S DECISION.—Elsewhere we print in full the text of the decision rendered by Judge Jackson in the matter of the Cleveland Gas Light and Coke Company vs. the City, in respect to the infamous 60 cent gas ordinance. It is reassuring to have positive knowledge that the superior Courts of the United States can be relied on to stand between the petty tyrants that strange opportunity wafts into official position and the property of those whom they would plunder under the buffoon's guise of a desire to benefit the public. We never had much doubt that the Cleveland conspirators would be checked and their desire frustrated, but the result, as foreshadowed in the Jackson decision, is likely to take on a National interest, so far as the manufacture and sale of artificial light are concerned.

MR. HARRY MAGUIRE, whose resignation as Superintendent of the Belleville (Ills.) Gas and Electric Light Company was formerly reported in the JOURNAL, is now in charge of the Duquoin (Ills.) Light, Heat and Power Company.

The London Journal and Mr. Rew.

The London *Journal*, in commenting upon a pamphlet recently forwarded it by Mr. Henry C. Rew, of Chicago, who wrote this time on the subject of "Illuminating Water Gas, Present and Future," says:

We are always pleased to receive original information on this subject, and accordingly we opened this fresh addition to the literature of the peculiar American institution of illuminating water gas with a feeling of expectant interest, more especially as we seem to have a faint recollection of having heard of the author before. It soon appeared, however, that we could say as much of the bulk of his pamphlet, which is largely made up of a wholesale appropriation from Mr. Frederick H. Shelton's well known paper on "Illuminating Water Gas, Past and Present," including most of the illustrations drawn for this paper, now looking generally the worse for wear. Mr. Rew evidently understands something of the practical side of water gas engineering, since he is able to criticize the different patterns of apparatus described by Mr. Shelton. It may be noted that Mr. Rew awards the palm for superior water gas making to the Springer improved apparatus, which he says is considered the best gas generator now in the market. Large cupolas after this pattern are in use in Chicago, and are reported to be producing enriched water gas faster and cheaper than any other apparatus known. They are credited by Mr. Rew with the duty of 30 lbs. of coke or hard coal, and 4 gallons of crude oil, per 1,000 feet of 22-candle gas. It may be stated here, for the information of English readers, that the Springer type of cupola is a tall cylinder of iron lined with firebrick; the lowest third being the generator, over which is a solid arch, while the upper two-thirds constitute the superheater, or fixing chamber, which is packed with refractory checker work. A bye-pass, provided with a valve, bridges over the arch, and establishes a connection between the top of the generator and the bottom of the superheater. Another pipe connection, likewise provided with a valve, leads from the top of the superheater to the ashpit under the generator, and the gas outlet is from the bottom of the superheater. The operation of gas making with this apparatus is as follows: The generator is charged with fuel—oven coke being the kind preferred, when it can be had. This fuel bed is blown up to incandescence by an air blast entering the closed ashpit from beneath, the producer gas passing off through the bye-pass into the superheater, where it is burnt by the addition of a secondary air supply, and makes the checker work very hot. The waste gases pass away through a valve on top of the superheater. When the apparatus is ready for gas making, the air blasts are shut off and the outlet valves closed. Steam is turned on upon the top of the fuel bed, and is drawn off down through the mass of coke, thus making water gas, which is conveyed (through the pipe connection already mentioned) to the top of the superheater, where it begins its downward travel in company with the enriching oil, which is admitted at this point. The superheater is hottest at the bottom, which is the last part touched by the carbureted gas; and this compound is, therefore, so fixed that it does not alter afterwards. Mr. Rew admits that the apparatus is good so far as it goes, but he declares that it cannot make gas to compete with coal as fuel.

Preference is apparently given by Mr. Rew to gas generators of the Siemens kind, without open top; for he remarks that the Lowe type of water gas apparatus, in which the Springer is included, is defective on this account. Also, he finds fault with the Lowe generators for only using coke or hard coal. Mr. Rew consequently tried for some years to make illuminating water gas from bituminous fuel; and his narrative is very candid with regard to the difficulties he encountered in the attempt. He appears to have adopted the Siemens-Martin open hearth steel furnace as his model, and to have set himself the puzzle of making illuminating water gas in a wholly closed circuit; saving everything that passed through the generator for some special purpose. After many abortive attempts, Mr. Rew has caught at the idea of an inclined retort for carbonizing his bituminous charge before gasifying its fixed carbon constituent. His very latest patent apparatus, therefore, comprises: (1) Inclined coking chambers, in which bituminous coal may be quickly coked by direct contact with fires; (2) generating chambers, for the manufacture of water gas, in which the coke produced in the coking chambers is immediately converted into gas without drawing it out into a distinct chamber; (3) regenerators constructed and operated on the Siemens-Martin plan; (4) condensers and washers for all the gas; (5) separate holders for different kinds of gas produced by the apparatus; and (6) a method of so operating the plant as to permit the plastic coal to be stirred up, and the grate-bars cleaned, without stopping work.

Mr. Rew excuses himself for thus, as he says, discarding the Lowe system; and he claims that his object is not to do the same thing in a different way, but really and truly to improve upon the Lowe plant. He cannot get away from the Siemens plan, however, nor does he attempt to do so; contenting himself with the statement that the Siemens system is superior to the Lowe plan of open-top generators. He is good enough to admit that perhaps Mr. Siemens ought to have been the inventor of this new device, instead of himself; but he dismisses this part of the question with the observation that possibly Mr. Siemens is so busy with his steel works, glass works, etc., that he has had no time left to devote to making illuminating gas.

Finally, Mr. Rew thinks he has succeeded, by his new type of gas producer with the inclined carbonizing retort, in solving the great fuel gas problem. He modestly says that it has been his aim "to design an apparatus for the complete conversion, in one operation, of either anthracite or bituminous coal, wood or coal dust, completely into the gas required; the methods being so economical and correct in scientific principles that they could not be surpassed and superseded, and the line of patents so complete, that competition and litigation with methods now in use, by a radical departure therefrom, could be avoided." Doubtless, Mr. Rew's inventive skill is as supreme as his mastery over the art of writing American with ease and elegance. After this, the only thing for other water gas engineers to do is to retire from business, and leave the future of their trade to Mr. Rew and his licensees. Seriously, however, while there is something ludicrous about Mr. Rew's pretentions, his pamphlet contains a good deal of miscellaneous information about water gas manufacture; and it is certainly worth looking through on this account.

The Market for Gas Securities.

Consolidated was practically unchanged during the week, the opening quotation to-day (Friday) being 99¼ to 100. The features in city shares were the sharp advance in Equitable, which moved up three points, and the closing of the stock books of the Standard Gas Company to permit the verification of certain shares, the validity of which is questioned. The Company's new President, Mr. J. A. Bostwick, evidently means to have things kept straight. The Company's works have not been closed yet, nor will they be, despite the efforts of the dealers in vacant lots "up that way." Brooklyn shares are all higher, the advance being very marked. We note the following sales at auction: 200 old Brooklyn, at 110; 48 Williamsburgh, at 111¾, and 75 shares same Company, at 110½. Chicago gas is still on the upward move, the 60 mark having been crossed to-day. Hartford gas is bid for at 127¾.

[Concluded from page 705.]

[OFFICIAL REPORT—REVISED BY THE SECRETARY.]

NINETEENTH ANNUAL MEETING OF THE AMERICAN GAS LIGHT ASSOCIATION.

HELD AT NEW YORK, OCTOBER 21, 22 AND 23, 1891.

SECOND DAY—AFTERNOON SESSION.

The President introduced Mr. Rollin Norris, of Philadelphia, Pa., who read the following paper on the

THEORETICAL EFFECT OF PRE-HEATING BLAST STEAM AND OIL IN WATER GAS MANUFACTURE.

The sharp competition of the electric light and of kerosene oil, and public sentiment, backed and emphasized by the, apparently, almost omnipotent, but alas! far from omniscient "city father," unite to demand that we supply our consumers with gas at the lowest possible price. Even without these spurs to effort, a broad spirit of commercial morality would urge us to reduce to the utmost our waste of manufacture.

An intelligent observer watching, with this idea in his mind, the operation of an ordinary water gas plant, cannot but be struck by the great quantity of energy that leaves the apparatus in the form of sensible heat, both of the blast products and of the illuminating gas.

It is to a consideration of these losses that your attention is invited, as well as to the possibility of reducing such losses by making the hot outgoing gases impart their heat to the incoming elements of manufacture.

Although the figures in this paper will be based on the performance of an apparatus of the Lowe type, many of them will apply with equal, and in some cases with even greater force, to the other types of machine.

In these calculations use will be made of the experimental data, given by Mr. A. G. Glasgow in his paper read before this Association last year, and entitled "The Commercial Efficiency of a Water Gas Apparatus."

The data used are as follows:

Table I.

	Per 1,000.
Total anthracite charged	33.4 lbs.
Ash and unconsumed coal recovered	9.9 "
Total carbon consumed	23.5 lbs.

Table II.—Carbureted Gas.

	Composition by Volume.	Weight per 1,000.	Heat Units per 1,000, per Degree.
C_2O and H_2S	3.8	4.65842	1.008082
$C_n H_{2n}$	14.6	17.09952	6.316563
CO	28.0	21.86800	5.421077
CH_4	17.0	7.58540	4.497384
H	35.6	1.99146	6.780125
N	1.0	0.78596	0.190684
	100.0	53.98876	24.213915

Table III.—Uncarbureted Gas.

	Composition by Volume.	Volume per 1,000 of Carbureted Gas.
CO_2	3.5	23
CO	43.4	280
H	51.8	334
N	1.3	8
	100.0	645

Table IV.—Superheater Blast Products.

	Composition by Volume.	Composition by Weight.	Specific Heat.	Weight per 1,000 Cubic Feet.
CO_2	17.4	24.64	0.05342	21.331
O	3.2	3.29	0.00718	2.856
N	79.4	72.07	0.17585	62.405
	100.0	100.00	0.23645	86.592

Table V.—Temperatures.

Illuminating gas leaving superheater	1,450° F.
Blast products	1,550° F.
Oil entering carbureter	235° F.

Table VI.—Miscellaneous.

	Per 1,000.
Heat lost by radiation and convection	28,150 heat units,
Heat lost as sensible heat of ash and cinder	3,712 "
Latent heat of gasification of the oil	12,841 "
Heat absorbed in the decomposition of steam	90,533 "
Air required	2,457 cubic feet.
Oil used = 5 gals. =	35 lbs.
Percentage of straight water gas in carbureted product	64.5 per cent.
Carbon used in blasting	13.9 lbs.
Carbon taken up by the steam	9.6 "

The elements used in the course of the manufacture of water gas are, coal, steam oil, and air, and, as it seems impracticable to preheat the coal, my subject divides itself into the three heads of: (a), steam; (b), oil; and (c), blast.

(a.) *Steam.*

As the steam and oil are used while the illuminating gas is making, we will calculate their capacity for absorbing the heat then being wasted as well as the amount of such waste.

Amount of Heat Carried by Escaping Carbureted Gas.

Table II. shows that each 1,000 carries some 24,214 heat units per degree of temperature, and as the temperature of escape is 1,450° F, the total sensible heat per 1,000 is 35,110 heat units.

24,214 (heat units per degree) × 1,450° = 35,110 heat units.

This is equal to about 2½ lbs. of carbon per 1,000.

Steam Used Per 1,000.

Table III. shows that each 1,000 contains 334 feet of hydrogen, which has been derived from the steam decomposed.

This hydrogen required for its production 15.89 lbs. of steam, or, in round numbers, 16 lbs. of steam per 1,000.

334 feet H. ÷ 1,892 feet per lb. = 1.7653 lbs of H.

As water contains one-ninth its weight of H., the 1.7653 lbs. of H. must have required 1.7653 × 9 = 15.8877 lbs. steam.

The amount of heat that this steam is capable of absorbing and carrying back to the apparatus, is 7.6 heat units per degree of rise of temperature.

Sixteen (lbs. steam) × 0.475 (specific heat of steam) = 7.6 (heat units per degree of rise).

The gases leave the stack at 1,450°, so this is the limit of attainable temperature of the steam. At this temperature, the steam would have absorbed some 8,500 heat units.

1,450° (final temperature) — 330° (initial temperature) = 1,120° (rise in temperature) × 7.6 (heat units per degree) = 8,500 heat units.

That is, with the steam raised to the very highest possible temperature, the total direct saving to be anticipated would be only a little over half a pound of coal per 1,000; and with the steam raised to, say 800°, which is probably as much as we could practically count on, the saving would only amount to about ¼ lb. of coal per 1,000.

The direct economy, therefore, of superheating our steam by the sensible heat of the outgoing illuminating gases is too small to warrant our going to much trouble to effect it, but the incidental results of such superheating may be more important.

Among these incidental advantages may be mentioned the thorough drying of the steam and the gasification of the entrained water, thus reducing the work required of the bottom of the fire. Moreover, the higher the temperature of the steam the nearer it is to the point of decomposition, and the less time it has to be exposed to the action of the fire. This means an increase in the capacity of the set, which in itself introduces some additional economies.

With very highly superheated steam, probably some trouble might be expected from clinker, but in my own experience, with steam heated to about 800° Fahr., practically no more trouble was met with from this cause than in a corresponding set run with saturated steam.

(b.) *Oil.*

As our steam promises to save but a small part of our waste heat, we must turn to the oil for assistance. Of the importance and advantage of preheating this element it is scarcely necessary to speak. With the use of crude and intermediate oils, some sort of preheating is almost a necessity, especially if the oil be fed directly upon the fire.

The capacity of 5 gallons of crude oil for absorbing heat is 15.2 heat units per degree.

35 (lbs. of oil) × 0.434 (specific heat as per Regnault) = 15.19 heat units required per degree rise in temperature.

A heater raising the oil 500° in temperature would absorb 7,600 heat units.

15.2 heat units per ° × 500° = 7,600 heat units.

This is only equal to a little over ½ lb. of coal, but sight must not be lost of the fact that the oil contains a large proportion of constituents that, at moderate pressure, would vaporize below 500°, and so the absorption of heat would be much greater than the 7,600 heat units, as figured above. It is evident, then, that the lower the pressure of the oil in the heater, the greater will be its capacity for heat absorption, and

the practical lesson is that our oil heaters should be operated under only as much pressure as is required to scatter the oil over the fire, or the carbureter bricks.

(c.) *Blast.*

We have seen that the amount of heat that can be recovered by pre-heating the steam and oil is necessarily small, but we come now to a more promising element—the blast.

As the air is entering the set while the hot blast products are leaving it, it is these latter that we will use as a source of heat for the blast.

Heat Carried by Blast Products.

The total heat thus wasted at an exit temperature of 1,550° is 78,000 heat units, or about 5½ lbs. of carbon.

The volume of blast products equals the volume of air used, or 2,457 cubic feet per 1,000.

.086,592 (weight per foot) × 2,457 feet × 0.23,645 (specific heat) × 1,550° temperature = 77,976 heat units per 1,000 carried by blast products at 1,550°. This is 50.3 heat units per degree, or 3.62 heat units per degree per lb. of carbon carried.

We will assume that pre-heating the blast will make no change in exit temperatures of the illuminating gas or of blast products in heat lost by radiation, convection, and cinder, or in heat absorbed in the decomposition of the steam.

The actual heat required in the set per 1,000 is, therefore, 174,000 heat units.

Heat absorbed in decomposition of steam	90,533	heat units.
Sensible heat of escaping illuminating gas	35,110	"
Loss by radiation and convection	28,150	"
Latent heat of gasification of oil	12,841	"
Sensible heat of oil at 235° = 35 lbs. × .434 specific heat × 235° =	3,570	"
Sensible heat of ash and cinder withdrawn	3,712	"
Total heat required in machine, per 1,000 =	173,916	"

This heat is supplied partly by the combustion to CO and CO_2 of the carbon taken up from the fire in the decomposition of the steam, and partly by heat stored in the set during the blow.

The first is readily calculated, and equals 48,000 heat units developed in fire during the run.

Each 1,000 of the carbureted gas contains 23 feet of CO_2 and 280 feet of CO, which carry 9.6 lbs. of carbon.

23 (feet of CO_2) ÷ 8.623 (feet per lb.) = 2.667 lbs. of CO_2.		
280 (feet of CO) ÷ 13.531 (feet per lb.) = 20.694 lbs. of CO.		
2.667 (lbs. CO_2) × $\frac{3}{11}$ (proportion of carbon in CO_2) = 0.73 lbs. C.		
20.694 (lbs. CO) × $\frac{3}{7}$ (proportion of carbon in CO) =	8.87	" "
Total carbon per 1,000	9.60	" "
Total potential energy of the C = 9.6 lbs. C × 14,500 heat units per lb. =	139,200	heat units
Potential energy of the CO produced = 20.694 lbs. CO × 43,956 heat units per lb. =	90,962	" "
Net energy developed in this partial combustion =	48,238	" "

The heat to be stored inthe set, therefore, equals the total heat required less the heat supplied by this partial combustion ; or 126,000 heat units.

Total heat required per 1,000 =	173,916	heat units.
Heat from C taken up during run =	48,238	" "
Net heat to be supplied during blasting =	125,678	" "

The heat stored in the set per lb. of carbon burned, equals total heat per lb. of carbon, plus the heat carried by the air for combustion, less the heat discharged at the superheater stack, per lb. of carbon burned.

The potential heat of a lb. of carbon is 14,500 heat units.

The air used for burning one lb. of C has a heat carrying capacity of 3.22 heat units per degree.

Table VI. shows that for 13.9 lbs. of C, 2,457 feet of air were used. So air required per lb. of C equals

2,457 (feet per 1,000) ÷ 13.9 (lbs. C per 1,000) = 176.8 (cubic feet air), 176.8 (cubic feet air) × 0.0767 (lbs. per foot) × 0.2377 (specific heat) = 3.22 heat units.

The heat leaving the stack per lb. of carbon is 5,453 heat units.

Table IV. shows that each lb. of blast products contains 0.2464 lbs. of CO_2 ; 0.2464 (lbs. CO_2) × $\frac{3}{11}$ (carbon factor for CO_2) = 0.0672 lbs C per lb. of products. One lb. of C therefore gives 1 + 0.0672, or 14.88 lbs. of products.

14.88 (lbs. products) × 0.23645 (specific heat) × 1,550° = 5,453 heat units.

A convenient way of expressing the saving to be expected will be by means of a formula.

Let t = the rise of temperature of blast. Then 3.22 t = heat units carried into the set by the air, per lb. of C and 14,500 + 3.22 t = total heat carried into set per lb. of carbon consumed.

The heat discharged at the superheater stack valve we have shown to be 5,453 heat units. Therefore the heat utilized in apparatus is (14,500 + 3.22 t) — 5,453, or 9,057 + 3.22 t = heat units per pound of C consumed in the blow.

As the total net heat required per 1,000 is 125,700 heat units, the carbon that must be so consumed in the blasting is $\frac{125,700}{9,057 + 3.22\ t}$ lbs. C consumed in blast at temperature t°.

The saving in coal per 1,000, due to pre-heating the blast t° by the heat of the outgoing blast products, is $\frac{214 + 49.73\ t}{9,057 + 3.22\ t}$ = coal saved per 1,000 for blast at t°. 13.9 (lbs. C with cold blast) — $\frac{125,700}{9,057 + 3.22\ t}$ (lbs. C with hot blast) = $\frac{192.3 + 44.758\ t}{9,057 + 3.22\ t}$ = saving in C per 1,000.

Dividing this by $\frac{3}{11}$ to reduce C to coal gives, after reducing,

$$\frac{214 + 49.73\ t}{9,057 + 3.22\ t} = \text{saving in coal per 1,000 for t°.}$$

For example, the coal to be saved by raising the temperature of the blast 500°, 1,000° and 1,500°, will be 2.35 lbs., 4.07 lbs. and 5.39 lbs., respectively.

The last figure, 5.39, would be unattainable in practice, as it would involve the use of a heater so perfect as to deliver the air at the temperature of the blast products as they leave the stack.

The reduction in temperature of the blast products, due to raising the air t°, would be $\frac{3.22}{3.62}$ t, or, roughly, $\frac{8}{9}$ t°.

It must be remembered that these figures are based on the very low consumption of 23.4 lbs. of combustible per 1,000. As the amount of coal burned per 1,000 increases, the margin of possible saving due the use of hot blast increases.

I have up to this point considered only the direct saving due to the heat actually returned to the system by the heated air ; but there is another advantage, which should in many cases effect a considerable economy. I refer to the resulting absence of condensation of steam in the lower part of the fire, and subsequent loss of heat in its re-evaporation.

The grate bars and ash at the bottom of the fire will necessarily reach a temperature at least as high as that of the blast, and this will be far above the condensing point of the steam. Thus the tendency will be to keep the fire well down on the grate bars, and promote a more complete combustion of the coal at the bottom of the fire. This means less cinder, less frequent cleaning of the fires, and consequently smaller loss of fuel in pieces too small to be recovered by screening.

Ordinarily, more CO is made in blasting than is needed to keep up the temperature of the fixing vessels, and this surplus is discharged unburned through the stack valve. A hot blast means a smaller consumption of coal, and consequently a smaller production of CO and a reduction in CO wasted.

The possible disadvantages of blast heating are the danger of overheating the grate bars, and the effect on the clinker formation. The former is a matter of construction detail, and I believe the clinker problem can also be handled.

SUMMARY.

Steam.—We have seen that the steam has a very small heat carrying capacity, and that its preheating will not pay unless the means employed be very simple.

The maximum direct saving to be expected is from ¼ to ½ lb. of coal.

Oil.—The capacity of the oil for absorbing heat is also small, but it must be preheated for economical candle power results, and the illuminating gases are a convenient source of heat for this purpose, and they give as high a temperature as the oil can well stand. Moreover, the vaporization of the oil in the heater makes its heat absorbing power greater than at first sight appears.

Blast.—The advantages of preheating the blast are :

1. A saving of from 2 to 8 lbs. of coal per 1,000, due to the heat actually returned to the apparatus by the hot air. 2. A saving of the heat usually lost in re-evaporating and decomposing the steam condensed out in the lower part of the fire during the run. 3. More complete combustion of the coal, and a smaller formation of cinder, involving less frequent cleaning of fires. 4. Less time required for blowing up the heats and a consequent increase in daily capacity of set. 5. Re-

duced waste of CO. The margin for fuel saving in water gas manufacture is no longer very large, but it seems that an efficient blast heater is the most promising factor in the problem.

Discussion.

The President—The paper is before you for discussion, and Mr. Norris will be very glad to explain the subject further if any member desires to ask any questions.

Mr. W. H. Pearson—I would like to ask Mr. Norris whether he has any satisfactory and workable method for preheating oil?

Mr. R. Norris—I can very highly recommend what Mr. Pearson has.

Mr. W. H. Pearson—But Mr. Pearson has not got any at the present time, because it would not work. I can describe the method which Mr. Pearson had, unless you choose to do it yourself—perhaps you had better do it—and then I would like to ask a few questions afterwards. Certainly, that method did not work well in Canada; I do not know how it works over here.

Mr. R. Norris—It is a series of pipes in the take-off pipe, into which oil is admitted at the bottom, and then goes up against the current of the gases.

Mr. W. H. Pearson—I am sorry to say that in our case the pipe very soon filled up with carbon. This was not under our own manipulation, but under that of a representative of the U. G. I. Company; consequently that failure cannot be attributed to any fault on our own part. Moreover, the pipe on several occasions, gave so much trouble, that the representative of the U. G. I. Company took it out, and we found that we can do quite as well without it as with it.

Mr. C. R. Collins—In the question of preheating oil at Toronto, you must take into consideration the oil which was used. It is a native oil, of much higher gravity than the Lima crude which we use in this country. We found there that we had an excess of heat, and necessarily lost a great deal of our waste product; and we found that this light oil could be vaporized readily without the use of the preheater. The preheater was continued in use for about 30 days, when it was definitely demonstrated that there was no economy effected, and that, necessarily, lampblack would collect from the lighter oil. I cannot say that the preheater is inefficient, but I simply say that in that case we had more heat than we could dispose of, and it was an unnecessary part of the apparatus.

Mr. W. H. Pearson—I am very much pleased to hear Mr. Collins admit that the Canadian oil is so much superior to Lima oil.

Mr. C. R. Collins—I do not think there is any question about that. We had no trouble in obtaining excellent results.

Mr. A. C. Humphreys—I would like to say a word in explanation of what we have got to look at in designing water gas apparatus. Mr. Pearson takes what Mr. Collins says as an acknowledgment that the Canadian oil is better than Lima crude; but it is not, and for this reason. Naphtha would not constitute a proper oil to use with that preheater—it never was designed for it, and it would surely make lampblack. Because of that fact—that naphtha cannot be used with that preheater—we do not say that naphtha is a better gas making material than Lima crude oil.

Mr. W. H. Pearson—I always thought it was.

Mr. R. Norris—I would like to ask of those who have had experience in the use of the hot-blast with superheated steam, whether the effect that can properly be expected is realized.

The President—Has any gentleman had experience in using the hot-blast in connection with a water gas apparatus?

Mr. F. H. Shelton—I had a little experience some time ago, and, although the results were not very definite, they pointed in that direction, and showed us that, working in that direction, we can get better results on top of the good results we are already getting. I refer to two small water gas sets that were under my charge 4 or 5 years ago. One was fitted with a blast heater and oil preheater, but had no device for steam superheating. It may be that that was added later. I know that another set, alongside of it, had none of these appurtenances. Upon cleaning the fires after a full day's run we were very much gratified to notice how bright and how good the fire was which had the use of this superheating attachment. We could find red coals clear down to the grate. The tax upon the bars was by no means so great where the preheated blast was used. That particular plant has since fallen into disuse from the fact that that work was experimental, and the attachments have dropped to pieces. The blast pipe at that time was made with soldered joints, and the air was preheated to such an extent that it melted the solder. So you see how hot you can get your air. I cannot say exactly how much good that hot air did, but with a properly designed blast heater and oil heater I have no doubt the efficiency would be materially increased.

Mr. W. R. Addicks—I am using naphtha, and I simply use a coil of pipe which is surrounded by a pipe, or rather by several lengths of pipe, containing oil, which is surrounded by steam at 80 pounds pressure, and approximating 325°. It is the identical style of pipe which was described a few moments ago. We use about a barrel of oil, probably, in 10 minutes, vaporizing it. I have also used two-thirds crude and a portion of naphtha, and it unquestionably improves the results, even with crude oil.

Mr. W. H. Pearson—What is the specific gravity of Lima oil?

Mr. R. Norris—It runs from 38° to 40° Beaume.

Mr. W. H. Pearson—Our oil is also 38° to 40°—just the same; so that I do not know where the great difference would come in.

Mr. F. Egner—I move a vote of thanks to Mr. Norris for his very instructive and interesting paper. I am sure we can appreciate it much better when we see it in print than we can at the present time. (Carried.)

Appointing a Committee on World's Fair Exhibits.

Mr. A. E. Boardman—I want to move, in conformity with the recommendation made in the report of the World's Fair Committee (which has been received, and the committee discharged), that a World's Fair Committee of seven be appointed by the Chair from members of the Association who are engaged in the manufacture of gas appliances, with a view to having as many gas appliances and applications of gas as possible displayed at the exposition.

Mr. G. W. Graeff, Jr.—I most heartily second that motion.

The President—It has been moved and seconded that the Chair appoint a committee, to be known as the World's Fair Committee, to consist of seven members of this Association representing the industries associated with our business—manufacturers of gas apparatus, etc. Are there any remarks?

Mr. F. Egner—I think it would be better to include all the manufacturers of gas appliances that are members of the Association, and thus to make a very large committee. Then they could organize, and would have the moral support of the American Gas Light Association.

Mr. A. E. Boardman—I am perfectly willing to accept the amendment, or to have the Association say what the number shall be. I thought the number I named was sufficient to get a good and efficient committee from; but, I would suggest, in order to meet the difficulties that may arise, that this committee have power to add to their number.

The President—Does Mr. Graeff second the motion as now amended?

Mr. G. W. Graeff, Jr.—Yes.

The President—Then the motion now is that a committee of seven, representing these industries, shall be appointed by the Chair, and that this committee, when appointed, shall have power to increase its own membership from that same class of gentlemen, who are also members of the Association. Does any gentleman desire to speak to the question? If not, all those who favor the adoption of this motion will say "aye;" the contrary, "no." It is carried, and the Chair will announce the committee in a few moments.

The President subsequently announced the following as the World's Fair Committee, pursuant to the above resolution:

T. J. Hayward, Baltimore, Md.; Wm. McDonald, Albany, N. Y.; C. W. Isbell, New York city; G. S. Page, New York city; John McIlhenny, Philadelphia, Penn.; A. D. Cressler, Ft. Wayne, Ind.; H. M. Hubbard, Chicago, Ill.

Mr. C. H. Nettleton—While on the subject of this World's Fair Committee I would like to say a word in reference to the erection of a building at Chicago. You all know that at the last Exposition, in Paris, the gas interests put up a very handsome building, and the Commissioners at Chicago have suggested that we might do the same thing. It has occurred to me that it would not be very difficult to raise a very large amount of money among the various gas companies throughout the country, if the thing was only brought to their attention in a proper manner. For instance if one hundred companies, the size of the one which I represent were to contribute $100 each, it would give $10,000 at once. Surely every company of the size of mine can well afford to invest $100 for the purpose of having the subject of lighting, heating and cooking by gas thoroughly shown up at the Fair. I sincerely hope that *the new* committee will not hesitate to call on the gas companies, if they find they need money and can use it to advantage. For one I shall be very glad to contribute in proportion to our means. (Applause.)

Mr. W. H. Pearson—I am very glad to hear Mr. Nettleton's remarks. I was going to say I feared that the gas industry was not going to be properly represented at the Chicago exposition; but I think that the gas companies of this country, with the help of a few of the gas companies of Canada, will be able to put up a building which will do us credit. Our Gas Company alone spent $2,500 in giving an exhibition in Toronto

8 or 10 years ago; and I think that if a Company of the size of our could do that, certainly we have the right to expect that the many gas companies in the States who will pull together, can put up a building which shall be satisfactory, and in which a proper and creditable display of gas appliances can be made. (Applause.)

The President—The Chair would be delighted to know that the gas industries of the country would be properly represented at the World's Fair, but your committee did not receive much encouragement when talking with the large companies on the subject. Perhaps the smaller companies will be willing to put their shoulders to the wheel and raise the necessary money; but the larger companies said "No" with considerable emphasis. The committee named by the Chair represent the various industries as well as the Chairman could, in the time at his command, make the selection; and as the committee have power under the resolution to increase their number to an unlimited extent, if the Chair has made any mistake in naming the committee they have it in their power to apply the remedy. They can have as many, and as strong men as they please to pick out; and the Chair sincerely hopes that their efforts will be fruitful of good results.

Resolutions Tendered to the Retiring Secretary.

The Chairman—Has Mr. Addicks, the Chairman of the Committee on Resolutions, anything to report?

Mr. W. R. Addicks—I will say that the committee have not yet had an opportunity to draw up their resolutions, and I would suggest that when prepared they be put on the minutes of this meeting without being previously reported to the Association.

The President—The committee on the subject of resolutions to be sent to our Secretary, Mr. C. J. Russell Humphreys, desire an extension of time, as they are not prepared to report at this session. Of course it is not necessary that the matter should be hurriedly reported, and the Association wants the thing done nicely and properly. I think the request of the committee to have their time extended is a proper one, and that we can trust to the committee to properly prepare and deliver the resolutions after the adjournment. If there is no objection the time of the committee will be extended as much as they may deem necessary.

(Note by the Secretary—The committee on resolutions, in accordance with amended instructions, later reported the resolutions as shown below.)

Whereas, Mr. C. J. R. Humphreys has tendered his resignation of the position of Secretary of the American Gas Light Association, and,

Whereas, In his enforced absence from the meeting at which the Association reluctantly consented to permit the serverance of his official relations to it, he has taught it how much of the pleasure of the yearly gatherings has been due to his kindly presence; therefore be it

Resolved, That the American Gas Light Association, in accepting the resignation of Mr. Humphreys of the position of Secre ary, which he has occupied to his own honor and its advantage for eight years, testifies by this writing to its appreciation of his intelligent and unremitting efforts to advance the interests committed to his care; and its regret tnat to these interests he feels he can no longer give the attention their importance seems to him to demand;

Resolved, That these resolutions be spread upon the minutes of the Association and published in the American Gas Light Journal, [here follow the names of two other papers] and that a suitably engrossed copy be sent to Mr. Humphreys.

THE QUESTION BOX.

The President—The Question Box is the only matter now before us. The Secretary will read the questions.

Question 1—"*What has been the result of gas companies furnishing gas by contract?*"

The President—Is any gentleman able to give an expression of his experience in this matter?

Mr. W. S. Bowen—The Company with which I was connected a few years ago did some business in this direction by way of meeting the opposition of an electric light company. In a small town such as ours was the loss of many customers meant a considerable decrease in the output of gas, and we arranged a schedule of prices which we thought would meet the prevailing rates as charged for electric lighting. After an experience of a few years in this direction we found that while we were being imposed upon by some people, there were others with whom we might deal in this way with great profit. Our experience during the last five years has been that during that time we have sold, in round numbers, about 9,000,000 feet of gas, at an income to us averaging $1.25 per 1,000 feet. That is somewhat less than our regular prices for gas would be; but, as I stated before, while we lost, or appeared to lose money on some customers, we made it up on others, so as to make the average about even. It has had another good effect in this particular—that the very class of customers whom we were able to hold while making these rates were those whom we could not otherwise supply with light—they would have gone to the electric light company anyhow; and by lighting these offices, stores and other business places, we kept our gas light prominently before the people. It was our interest to always keep those places properly lighted by seeing to it that the burners and fixtures in those establishments were of the proper kind, and were kept in good shape, so that we might always point to them as our advertisement of the utility of gas lighting. I might say the experience of our Company has been quite satisfactory in that direction, and that we see no reason why we should not just as well continue that practice as to light street lights by contract, as has been the custom for many years.

The President—The Chair being engaged at the moment of commencing your remarks, did not understand whether you are furnishing gas by contract through a meter, at a stipulated price per 1,000. What was the contract?

Mr. W. S. Bowen—The contract is at so much per month, regardless of burning. For instance, we contract to light a given number of lights at a given price per month. I might say in all the places that lighted in this way we have kept our meters set and had regular monthly readings of the meters, and so at the end of a few months, or at least at the end of the year, we were able to form a pretty correct idea of the probable consumption; and where we thought it was necessary we were able to intelligently raise the contract price, as we had to do in some instances.

The President—It has been the experience of the Chair in that direction, that in competing with the incandescent light we never made a single contract with anybody at a price per month, that the user did not immediately increase from 30 to 50 per cent. on the agreed consumption, so we had to stop it in every instance. Very greatly to my surprise this was true of some of the apparently most reputable merchants in the town. Our experience was such as to convince us that the very worst thing we could do was to sell gas to a man by contract, unless it was contracted through a meter. If no other gentleman desires to speak further in elucidating this question, we will consider it fully answered.

Question II.—"*What success has been attendant upon the use of explosives for cleaning stopped services?*"

The President—Have any gentlemen had experience in the use of explosives—other than those of expletives—in the cleaning of stopped services?

Mr. N. W. Gifford—I will speak of an instance where some boys attached a gun to the riser of the lamp post, inserted a blank cartridge and tapped it with the hammer, thereby saving considerable labor. It worked first-rate until the manager "got on" to it, and then it was stopped.

Mr. J. E. Nute—While I have had no experience myself of the clearing of services by explosives, I may mention one instance which came to my knowledge, where a regular horse pistol was arranged with a thread on one end to fit the top of the lamp post, and then, a charge of powder having been inserted, the pistol was exploded with the result that, with a sufficient charge of powder, you could nearly blow the service to pieces.

The Secretary—The next question has not been put in the usual form, but as the gentleman who put it is not here, and cannot take it up afterwards, and explain it more fully, perhaps I had better read the letters which I received from him: (Reading) "I would like to have information from some of the members, during the meeting, in regard to the effect of unpurified water gas on holders. My attention was called this A. M. to a bad leak in the up and down seam of our relief holder. On examination, I found the joint to be open 10 inches. Cause, either the rusting of the plate or the riveted part of the rivet. I also found the sheets very thin, caused from the internal rusting of the sheets, as the outer part is quite free from rust. The gas goes into the holder warm, and with considerable moisture from the absorption of moisture from the washbox, and I suppose some steam. The water from the drip of the inlet is pumped into the holder tank. The water in the tanks shows very dark, although there is a constant stream of Mississippi, unclarified water going into it, so as to change the water as much as possible. We also use much water in the washbox to try and keep the dust from the take off pipe. I have repaired bad leaks on the crowns of holders when we were making *coal gas*. Although some of the patches were large, the sheets were generally pitted, not weakened—as I generally find in these cases, and it is a delicate operation to do this repair, especially as it takes a seemingly small portion of the gas *internally* to make a man quit work, as I have experienced this A. M., and on

many other occasions. My question would be as previously stated, and also as to the experience any of the members may have had in patching badly rusted or very thin plate. The method of boring holes, shape and size of bolts used, distance apart, and material used for the joint. The holder next to the relief holder, same size and built at the same time, seems to be in first rate order or condition. It is used for the commercial gas. Hoping to get the desired information, I remain. (Reading second letter from same member). I had forgotten to mention that the relief holder was built in 1870, and has been used to date; from 1870 to 1884, on coal gas; from 1884 to November 2d, 1888, on coal, oil and water gas; from November, 1888, to date on water, or *blue gas*. The top section seems to be in better order than the bottom section, and the top sheets of the bottom section better than the lower sheets We have two holders in use over 40 years, and they seem to be in good order. Another in use 33 years, looks first rate. One of the over 40 year holders had a crown put on about 10 years past. Most of the sheets were very much rusted, others had hardly a spot on them." I will say further that from what I know of the works this is not unpurified carbureted water gas, but unpurified non-carbureted water gas, the same as they get in the New York Municipal.

Mr. A. S. Miller—I think, from the way the paper reads, that the trouble was in the holder tank and not in the holder itself. The effect seemed to increase from the top of the holder down to the bottom, and I should judge by that that the trouble is with the Mississippi water in his tank, and not with the gas.

Mr. Walton Clark—Mississippi water will not hurt iron. There is a holder at that same gas works which has been in use for 40 years, and the Mississippi water has not hurt it; it is as good as ever. I think the trouble is that the gas goes in hot, carrying steam from the generator. There can be no doubt that in blasting, sulphurous acid is produced; and if, as may be the case, from careless manipulation at any time, any amount of blast gas is permitted to go with the crude water gas, it would carry with it a certain amount of sulphurous acid. Efficient scrubbing removes that, and inefficient scrubbing will not remove it, and the probability is that a certain amount of sulphurous acid got into the holder, and the steam, condensing on the inside surface of the holder, forms sulphuric acid by oxidation, or at any rate it was there in the form of a solution of sulphurous acid which would attack the holder sheets. If the gas had been properly scrubbed or condensed, there would have been no sulphurous acid present. From what has been said, and from hearing the letter read, I believe I know the works. If so, I have myself, at those works, found sulphurous acid in the washbox—I am satisfied that it all comes from the presence of sulphurous acid in the water gas.

Mr. W. H. Pearson—Does not Mr. Clark think Mr. Slater, who has given up the use of water in his scrubbers, would be liable to the trouble complained of? Would not sulphurous acid reach his relief holder?

Mr. Walton Clark—I do not think it would. I understand he gets his gas so cold that there is no steam going into his holder. If he does, he takes steam that is carrying sulphurous acid, and sulphurous acid is very soluble, and the steam when condensing would certainly carry it out with it.

Mr. F. B. Crowell—We have two holders in use at our station, which have been there for about ten years, used for hydrogen gas. The gas goes directly from the generator, and is therefore very hot, and carries a large amount of steam with it. I have one holder at present open, and it seems to be as good inside to-day as it was the day we put it up. We have never had any trouble with it at all. We keep quite a stream of water running in each of them, and we find that in time the water gets very foul and black.

Question IV.—"*What is the best method of using naphtha as an enricher in small works?*"

The President—That is a question of great interest to the large class of our members who are engaged in the gas industry. Will some gentleman kindly suggest what in his judgment is the best method of using naphtha under those circumstances?

Mr. A. E. Boardman—Not being interested in any patent apparatus, I would like to state that having tried to use naphtha to enrich gas I believe the best way is to make carbureted water gas, and then mix the two gases.

Mr. W. R. Addicks—Within a month we started up one of our works, and had an opportunity to measure the uncarbureted water gas, and then the gas that was finally carbureted, and we found that in using the oil naphtha in the retort we got a yield of 80 cubic feet, and candle-feet per gallon of 3,800, thus showing very poor efficiency for using naphtha in the retorts without coming in contact with carbureted water gas. I will say, however, that I had some information yesterday which throws some light on this subject. We pass all this gas through the wet purifier; and I shall have to investigate as to whether that has any effect upon the candle power.

The President—Nearly every gentleman present has tried to enrich his coal gas by using crude oil or naphtha in some way.

Mr. J. Somerville—I will state an experience which might help him out. I was short of cannel at one time and had to use oil and naphtha. I could not work it satisfactorily in a retort, so I took the oil to the coal shed and mixed it with a quantity of dry slack coal until it was perfectly absorbed and the coal was dry. With the material in that condition I took a few shovels of it and put it on each bucket of coal that we took into the retort house. I found that I got the best satisfaction by that method. It is possible the writer of that question will try that plan; not having a water gas apparatus, it might succeed.

Mr. J. M. Rusby—Some time since a series of articles appeared in the *Journal of Gas Lighting* with reference to the Maxim process, in which the coal gas was enriched with naphtha vapor. The naphtha was vaporized by means of steam, and put right into the main inlet of the holder. For some time there were very favorable reports of the result, but I have not heard from it of late. That was a year ago. If any other member has heard of it since that time it would be very interesting to know what results have been attained.

The President—Has any member noticed the effect of using naphtha in the manner suggested?

Mr. I. Butterworth—I have been asked to tell what we are doing at Columbus. We are there enriching coal gas with naphtha. This question asks for the best method. I will not pretend to answer that question, for I can simply state what we are doing. We run the naphtha by gravity into an ordinary coal gas retort—one of a bench of sixes—five retorts being used for carbonizing coal at the same time. We run in about half a gallon of oil per 1,000 feet of gas made. After filling the front of the retort with loose firebrick the oil is passed back through the retort towards the rear through a 3-inch pipe. By regulating the heat and adjusting the size of the stream of naphtha accordingly, we have found no trouble from the deposit of carbon.

The President—The Chair has had an experience with the use of naphtha and crude oil in enriching coal gas, and never found anything superior to the method which Mr. Butterworth describes. I think that nearly all our New England men at one time and another have enriched their coal gas in practically a similar way. I know of nothing which is superior to it.

Question V.—"*What size of purifiers should be had for oxide with make of 200,000 cubic feet per day?*

The President—Brother McMillin and myself are struggling for a living down in Pine street, and are trying to do this sort of thing right along; and Mr. McMillin desires me to thank the Association that they are not tearing the shingles off his new roof. I think that question is answered.

Question VI.—"*What per cent. of free sulphur should spent oxide contain?*"

The President—If any gentleman engaged in purifying his gas with the use of oxide has made any examination of that subject, and desires to impart the information, we shall be glad to have the question answered.

Mr. T. Littlehales—I think it can be very satisfactorily worked, and with fair economy, until it contains about 40 per cent. of sulphur, after which time it is a great deal better to buy new oxide than it is to go to the labor of throwing in so much inert material. Of course, with the oxygen process it can be carried very much further than that, but the English practice is to run it to about 45 per cent.

Mr. E. McMillin—I suggest that if the previous question could have been answered it would have thrown some light on this. If a man who is making 200,000 cubic feet per day has very large boxes, he can run his oxide longer than one who has small boxes.

The President—But I notice at the same time that you give away no merchantable information. (Laughter.)

Question VII.—"*Would it pay large gas companies to collect their bills through the American Express Company? Has any member ever tried that plan?*" Why the "American," especially?

Mr. G. A. Yuille—I think it would be well to occasionally bring before this Association questions connected with the selling of gas. We have to do with making gas, and are endeavoring to find means of making it as cheaply as possible; but there is seldom any discussion with us

upon the point of selling it. We all know that there is a great deal of dissatisfaction among consumers of gas; and we know that it arises in the manner in which it is sent to them, and the opposition against their using it which the gas companies all have. What we want to day is to put gas into the houses in the best kind of shape, and then to let them pay their bills in as convenient and smooth a manner as possible. In Chicago the American Express Company enables consumers to pay their gas bills at a number of different points, and so they are not compelled to come to the gas office and waste an hour or more in order to settle up their accounts. In Chicago about 30 per cent. of the bills are paid through the Express Company. It relieves the Gas Company, and makes it very convenient for the consumer.

The President—The Chair understands that in Chicago two years ago a very large percentage of the bills of the Gas Company was collected by local express companies—in this case I believe by the American. Instead of the consumer having to go to the gas office to pay his gas bill, he can walk to the office of the Express Company in his immediate neighborhood and pay his bill, and the Express Company gives a receipt.

Mr. G. T. Thompson—We have a similar system in St. Louis, but in our case only about 17 per cent. of our accounts were paid to the Express Company. The fee for collection on bills under $25 is 5 cents, a portion of which goes to the Express Company for handling the money, and a portion to the men who collect the bills—in our case usually druggists. We have about 30 offices throughout the city of St. Louis which receive payment of bills up to the 10th of the month, which is our last discount day. After the discount day is over all bills must be paid at the office.

Question VIII.—"*Will it pay to utilize hydraulic main liquor of one to two ounces strength, such liquor running into a well by itself, separate from the scrubber liquor? And by what process can it best be utilized?*"

The President—Cannot Brother Page elucidate that a little?

Mr. G. S. Page—The question undoubtedly refers to one or two ounce liquor. If of two ounces strength it would pay to run it to an ammoniacal liquor tank, after separating the liquor from the tar so that as small a percentage of tar as possible goes forward to the ammoniacal liquor tank. It is rather more difficult to work, and yet in practice it has been found to be economical to save liquor of that strength.

Mr. C. H. Nettleton—At the works in my charge all the liquor runs from the hydraulic main to the tar well, and from there to the ammonia water well; and when by any chance the liquor becomes so weak that it cannot be used economically in the concentrator, it is pumped into the standard washer about midway its length, and in that way the strength of all the liquor in the well is increased.

Question IX.—"*What comes properly into the account in estimating the cost of gas in the holder?*

The President—That is a dry, old, chestnut. I believe that from the snow clad hills of Maine, down to the warm waters of the Gulf, where our friend Clark once came from, that old question is reverberating all the while. Everyone has tried to answer it but no two persons have ever yet agreed.

Mr. Walton Clark—There is one comprehensive answer to that question, and that is, all the items which go to make up the cost of the gas.

The President—I never yet saw Walton Clark when he could not answer a question; and I think this question has been answered by him.

Question X.—"*By what right does* [here follows the name of a paper printed in Philadelphia] *publish lighting statistics which have been furnished to the Government in confidence and under a promise of secrecy.*"

The President—The Chair would rule that the United States Government is the authority with which we would have to take issue upon that question.

Mr. G. W. Graeff, Jr.—I would like to answer that question.

The President—You may, if you wish, but I do not think it is necessary.

Mr. G. W. Graeff, Jr.—I wish to state that [the name of the Philadelphia paper is here repeated] has not published any census returns which had not been previously published by the United States Government in the form of census bulletins. The returns to which I suppose that question refers, were published, I am sorry to say, nearly a whole month as a census bulletin before I got hold of the bulletin.

The President—The Chair is quite familiar with that fact, as I presume that a great many other members are; and considers an answer to that question unnecessary. That concludes the questions, and also the business of the Association, unless some member has something to offer under the head of new business.

Votes of Thanks.

Mr. W. A. Stedman—I was about to say that, if the business of the Association is concluded, I want to make a motion. We owe a cordial vote of thanks and of appreciation to our Acting-Secretary, Mr. A. C. Humphreys, for the very efficient manner in which he has discharged the duties which were so suddenly thrust upon him. We all know how it is in the life of a busy man. He gets absorbed in the details of carrying on his own work to that extent that it is very difficult for him to divert his mind from his work, and to do thoroughly and efficiently every task which may be suddenly thrust upon him; but in the present case I leave it to the members to judge how efficiently the work of the Secretary has been done, and how heartily it has been undertaken. It is true, perhaps, that it was largely a labor of love in his case, but nevertheless it has imposed upon the Association a very great obligation for the manner in which he has discharged the duties which became so unexpectedly his. I appreciate, as I think all the members do, the gentlemanly and persistent way in which he has forced the recreant members to chip in their back dues, as well as their front dues. I think, considering the very little time he has had to get at them, he has had very remarkable success in bringing them up to the Captain's office and having them settle. I know the Association will join in a very hearty vote of thanks; and I wish it had fallen to the lot of someone abler than myself to express in a fitting manner the obligation which we all feel towards our Secretary. Of course we are all sincerely sorry for the absence of our regular Secretary, but in his absence I can conceive of no one who could have more efficiently performed the duties of the office than the gentleman who has so kindly taken them upon himself. (Applause.)

Mr. C. H. Nettleton—I heartily second the motion which Col. Stedman has so sincerely made. The work, as we all know, has been done very thoroughly; and when I tell the members that Mr. Humphreys held the Council from 8 o'clock until 1 o'clock, the night before the meeting, and kept us going every moment, you will understand the amount of preparation which he put into our work. I heartily second the motion.

The President—It has been regularly moved and seconded that a vote of thanks is due from this Association, and is hereby tendered to Mr. Alexander C. Humphreys for his faithful fulfillment of the duties of the Secretary during this meeting, and preceding the meeting. Does anyone desire to say anything in connection with this motion other than has been said. I will ask all those who favor the adoption of this motion to rise. I will spare myself asking for the negative vote. I have the pleasure of assuring you, Mr. Humphreys, of the unanimous thanks of this Association for the very hard work which you have performed for the Association, for the manner in which you have done it, and for the zeal which you have shown in that work; and I beg to say to you personally that this expression of thanks finds a hearty echo in my own heart. I have known something of the labors of the Secretaryship (for I did them awhile), and I thought that your brother was one of the best of Secretaries, and have felt that we were about to dispense with the services of the best Secretary we have ever had; but I think that I said yesterday, in the few remarks that I made, that you gave us an idea of how efficient a Secretary you could be if you tried. I feel that it is a fortunate thing for us that we had you to call upon, and that it is fortunate for the gentleman who is to succeed you in the Secretary's office that he has such an example to look to. I assure this Association that never in my life, in connection with the various Associations and bodies to which I belong, have I ever seen the same amount of work, so promptly and systematically done, and the whole story of the work laid before the Board of Directors so thoroughly, as were the statements that were laid before this Council by Mr. Humphreys, our Acting Secretary. (Applause). You simply have done yourselves an honor in honoring this gentleman as you have by your vote, and I thank my good fortune that I have had the pleasure of saying what I have.

Secretary Humphreys—Gentlemen of the Association. I thank you for the motion that has been carried in my favor. I thank Col. Stedman for the very happy way in which he brought it to your attention, and I thank the President for the way in which he has tendered the thanks of the Association to me. I think that I may say, without saying anything that I ought not to say to the Association, that Col. Stedman hit the mark when he said that it was with me a work of love; and if in doing my duty by my brother I have also done my duty by the Association, then I am doubly pleased. I thank you sincerely for your expression of appreciation. (Applause).

Mr. Walton Clark—I move a hearty vote of thanks to our Acting

President for the able manner in which he has filled his temporary office.

Mr. A. C. Humphreys—I have great pleasure in seconding that motion.

Vice-President Boardman—Gentlemen, you have heard the motion, duly seconded, that a vote of thanks be tendered to our Acting President for the manner in which he has conducted the present meeting. All in favor of that motion will signify it by rising.

It is most pleasant personally to me to be the one whose duty it is to express to you these thanks. Knowing, better than probably any other member of the Association, the sudden demand made upon you to occupy the Chair and conduct the business of the meeting, and also the demands upon your time and attention made by your unremitting efforts as a member of the Committee of Arrangements, besides the stress you have been under with looking after your own business, I can thoroughly appreciate the obligations we are under for the able and pleasant manner in which you have directed our proceedings. You have referred to the fact that in the purely social sphere your efforts to make the meeting pleasant would perhaps be rewarded with a measure of success; but, believe me, sir, that this Association, while giving you the crown of grape leaves as the prince of good fellows, also awards you a laurel wreath for your executive ability as Acting President, and for your unquestioned worth as a Gas Engineer. Your sparkling wit does not blind us to your true worth, and I believe I voice the sentiment of this Association when I say, that our thanks are due as much for your efforts to advance the business of the meeting as for the aid you have rendered to make it enjoyable. (Applause.)

Acting President White—I thank you. I need only thank you now, for I know that you will get enough of me before 12 o'clock to-night. I will simply say I have endeavored to the best of my ability to fulfill the duties that were entrusted to me so suddenly and unexpectedly. You all know how much I regret the necessity which called upon me to preside. It was something that Mr. Harbison had looked forward to with a great deal of pleasure and with anticipations without measure, but unfortunately he has been deprived of it. If I have merited these thanks I am glad to have received them. I have tried to be fair and strictly impartial. If I have not been, I regret it. Again I thank you.

On motion of Mr. Boardman, seconded by Mr. Egner, it was

Resolved, That the hearty thanks of this Association are due and hereby tendered to Messrs. Wm. R. Beal, Oscar B. Weber, Wm. H. Bradley, Eugene Vanderpool, Fred. S. Benson and Wm. H. White, comprising the Committee of Arrangements, for the considerate and efficient manner in which they have planned and carried out the arrangements for this meeting; and for the courtesies extended to the ladies accompanying members of the Association, and also for the promised entertainment of Banquet and Excursion.

The Association then adjourned.

The Cleveland Gas Light and Coke Company Scores a Substantial Victory.

Judge Jackson, in the United States Circuit Court for the Cleveland district, handed down the following opinion in the case of the Cleveland Gas Light and Coke Company against the authorities of the city. As will be remembered, the Council ordered that gas be sold at the rate of 60 cents per 1,000, whereupon the Company appealed to the Federal Courts for a decree declaring the ordinance void on the ground that, as it virtually confiscated plaintiff's property, it was unconstitutional. The city filed a demurrer, urging that the bill be dismissed, defendant's attorneys insisting that the Federal Courts had no jurisdiction. This is the point settled by Judge Jackson, who sustains the Company's view in no uncertain way. The Court said:

The Constitution and the laws of the United States made in pursuance thereof, are the supreme law of this land. We are all citizens of a dual government, State and Federal. The people of the States made the general government and conferred upon it its powers, and they have expressly said in the Constitution of the general government that the Constitution of the general government and the laws and treaties made in pursuance thereof, shall be the supreme law of the land. We must give effect to that, beyond any question, however it may affect what may be called the dignity and sovereignty of the States. This, as already stated by the Court, is one of the most important questions that the Court has had before it for years. It is the great question of the future, as to how far legislative authority (the legislatures of States and municipalities acting under legislative authority) may, under the guise of regulation, attack the property of individuals or corporations.

Now, what is the case we have before us? In February, 1846, the legislature of Ohio, under constitutional authority, chartered the Cleveland Gas Light and Coke Company, with power and authority, the privilege, as we call it, to manufacture and sell gas within the city limits of Cleveland. It did provide, as all this class of legislation usually provides, that before entering upon the streets of the city that were under the control of the municipality, for the purpose of laying down its pipes, its mains, and so on, it should get permission of the city. The city, in due time, gave its permission, and having given its permission, and the Company having laid down its pipes, the city, under well established authorities, could not withdraw its consent. It became a fixed and vested right, under the terms and provisions of the charter, to manufacture and vend gas within the city limits of the city of Cleveland. That is clear beyond a question. The Constitution and laws of Ohio at that time reserved no power either to repeal that charter or modify or alter or to change it in any respect. By the terms of the charter there is necessarily imported into the right of the Company, or necessarily implied, the right to charge a reasonable rate for all gas furnished, just as though that right had been expressed in the most positive terms in the charter itself. We read into that charter, therefore, the right conferred to make a reasonable charge for what it supplied to the city and the inhabitants of the city of Cleveland.

There was no power in all the aggregated sovereignty of Ohio to deal thereafter with that charter; the State had no power to deal with it to abridge, curtail or limit its powers, or to deprive it of its franchises after it had accepted its charter and laid down its pipes. Neither the city nor the State itself in its sovereignty had any power thereafter to modify, change or alter that charter right of the Gas Company. The Constitution of 1851 was as invalid to affect that charter as any legislative act passed without reference to that Constitution. The Constitution of 1851, in providing that there should be the power to regulate, modify, alter or change charters, necessarily referred to charters thereafter passed, or thereafter granted. It is well settled, under the decisions, that so far as the contract feature of the Company's charter granted in 1846 is concerned, it would be as much beyond the power of a convention making a new Constitution to affect it as it would be beyond the power of the legislature to affect it. The whole sovereign people of Ohio, gathered together in convention, could not make a new Constitution that would affect the rights of a corporation thus created in 1846.

We come on down to an act of the legislature subsequent to the adoption of the Constitution of 1851, an act which was passed after all the vested rights of this corporation had accrued, the date of which will be ascertained by a reference to the act, and which was an act authorizing municipalities in which gas companies are located or doing business to fix the price at which gas shall be sold. We find the Supreme Court of Ohio construing that act, saying, in substance and in effect, that the price thus fixed by the municipal corporation is conclusive, unless it is attacked for fraud—that it may be attacked for fraud.

We find, then, the Municipal Council of Cleveland fixing the rate of charge which this complainant shall make for its gas to consumers at 60 cents per 1,000 feet. The bill alleges distinctly, as matter of fact, and not as inference of law, that it cannot manufacture and deliver gas at less than $1 per 1,000 feet, without loss, and that the city in fixing the price at 60 cents per 1,000 feet has fixed it at a price greatly less than that at which it can manufacture and deliver the gas. It claims that this is a taking of their private property without due process of law, and it alleges that this action was had without notice. These are all facts that we have to take, as conceded by the demurrer.

The question now that faces the Court is whether a municipal corporation, itself a consumer of gas, as alleged in the bill, in its corporate relations to this Company, to the extent of $5,000 or $6,000 per month, can, under the legislative sanction conferred by section 2478 of the Revised Statutes of Ohio, fix, or has the constitutional right to fix, the terms or price at which itself and all other consumers shall pay for the gas furnished. It would be a fearful proposition—monstrously absurd and outrageous—if the Legislature were to undertake to confer upon a citizen of Cleveland the right to say at what price services should be rendered to him or what he should pay for goods and articles furnished to him. There is hardly any law in this land that would make the party being furnished the judge of the price that he should pay, or would say that his arbitrary decision should fix the rights of the parties. The city of Cleveland has undertaken to do that thing under this section 2478, as disclosed by the bill. I am only dealing with the facts disclosed in the bill. She has undertaken to say that for the gas furnished to herself and to every consumer in this community the complainant shall only have and receive 60 cents per 1,000 feet, 40 per cent. less than the complainant can manufacture gas and deliver it.

The complainant comes into this court and in its bill, in substance and

effect, says three things: "You are by that action impairing the obligation of a contract that was made in 1846 between ourselves and the sovereign State of Ohio, and you cannot do that under the Constitution of the United States, which is the paramount law of this land, and which prohibits any State from impairing the obligation of a contract, either doing so directly or through the instrumentality of a municipal corporation by delegated authority." The thing cannot be done and ought not to be done. If we reflect about it for a moment we will see that those two features of the Constitution of the United States the prohibition against the impairment of the obligation of contracts and the interstate commerce clause of the Constitution—the protection of persons and property against arbitrary action upon the part of the States—are the very fundamental principles upon which the preservation of this government must rest. If those constitutional provisions are not recognized by right thinking men, if they are not rigidly enforced by the Federal Courts, the government of these States would not stand together for ten years. There would be no machinery or power in the land to hold them together. If they make war through their legislatures and their delegated authorities upon vested rights and contract obligations, if they may interfere with the commerce of other States, if they may be at liberty to deprive individuals or corporations of their vested rights and dispose of their property rights, this government could not stand—I mean as a government of free institutions—any more than a government might be called free that would undertake to take the services of the individual, that would undertake to fix the price at which he shall sell his goods, or at which he should render services to his fellowmen. The government does, it is true, in a certain class of cases, exercise a guardianship over certain parties. It takes the poor sailor under its protection because he is an improvident creature, so to speak, and will watch over his contracts, shield him against the schemes of the wise, and prohibit the ship-owner from dealing with him in an unjust way. In the distribution of its bounty to its soldiers who suffered and encountered wounds and disabilities during the war, it will award its bounty upon terms that will prevent any attorney or agent from unduly encroaching upon their enjoyment of that bounty, and that has been held to be constitutional, as protecting the object of the government's bounty. But when you pass those two subjects, neither the government of the United States nor any State has the right or power to say what you shall charge for your services, or for the products or goods that you may market, if you are not exercising a public privilege. If you are exercising a public privilege, then there is one limitation upon the power of regulation, and that limitation is, that in the reduction of price, or in the reduction of the compensation for services, you must not go beyond the limits of reasonable compensation.

Now, what is the adjudication of the United States on this subject? I will notice it but a moment. The question came up in Munn vs. the State of Illinois, in reference to the elevator company. The question there presented was this: Is a company or individual who dedicates or appropriates his property to public use subject to legislative authority and control on the subject of the compensation he shall charge for the use of his property? That was the sole question. The Supreme Court of the United States, speaking through its then distinguished Chief Justice, said "Yes." The case involved merely the power; nothing more. There was not a word about the question as to the limitation upon that power. There was not anything in the case that called upon the Court to define the limitation of the power, or decide to what extent it might or might not go. But they did say in that case that when an individual or company dedicates its property to a public use, applies it to public use, invites public use, that the police power of the State extends over the company to the extent of fixing rates. That was the only question presented, and the only question that the Court was then called upon to consider.

Subsequently there came before the Supreme Court of the United States from Mississippi the question as to the power of the railroad commissioners of that State to fix the rates of the railroad companies running through the State for the carriage of passengers and freight. In that case some of the companies, in their charters, were allowed to charge reasonable rates; some of them were allowed to charge not exceeding four or five cents per mile; some of them had provisions that their Directors might fix rates, and so on. The Court said in that case simply that the power did exist, notwithstanding those provisions of the charters. Notwithstanding those provisions in the separate charters of the different companies the Court held that the State of Mississippi did have the right to delegate to railroad commissioners the authority to regulate rates. But it distinctly stated, through its Chief Justice, in that case: "How far this regulation may go we do not now say. How far they may go in the direction of destruction we do not say. It is a dangerous line to define. It may be as definable as the lines between the colors in the rainbow." So they properly said: "We will wait until the precise question comes before us; but we throw out the intimation now that we do not mean to pass upon that question of the limitation of the power."

Then came the Minnesota case against the Chicago, Milwaukee & St. Paul Railroad Company. In that case the Supreme Court was brought face to face with the question: "May the power of regulation which we concede in the States, go to the point of taking the services of these public carriers and fixing a rate which will be less than what is reasonable, just, and right, and less than will yield them a fair compensation for their services." They met the question, and they met it by saying that the question of a reasonable rate was a judicial question; that the question of a reasonable compensation was a judicial one; that it was not in the power of the State, directly through its legislature, or through the delegated authority of a commission, to fix arbitrarily the compensation or to stop and shut the mouth of the party who was to render the services and earn the compensation. They said further, that whenever you take a man's services or property for less than they were worth, you are taking them without due process of law, that under such arbitrary action and under such arbitrary legislation you are taking it against the provisions of the Federal Constitution as embodied in the fourteenth amendment, are depriving him of his property without due process of law. The courts have been driven time and again by the necessities of our situation to advance their steps in the direction of protecting property. The old theory upon the subject of eminent domain was that it related alone to the taking of property for public use. The Supreme Court advanced a step in one of its recent decisions beyond that by saying you take it, in effect, when you impair its value; that when you come so close to my property as to impair its value by the exercise of eminent domain you are taking property just as effectually as if you put your rails upon it.

I say, therefore, the condition of the country and the tendency of legislation brought them face to face in the Minnesota case with the question of how far the States, under the power of regulation, had the power to deal with the rates that would fix them at figures that were not reasonable and not just to the companies rendering the services of furnishing the articles. And they have distinctly said, and there is no misunderstanding their meaning, that when they go, without a hearing, to a point beyond what is reasonable and right, that the action of the State, directly, or through its municipalities, is the taking of property without due process of law, and infringes upon that constitutional provision that is invoked in this case. That it is a federal question admits of no doubt in the world. This court has had repeated occasion to consider the question as to whether the parties are compelled to go through the State courts. That is not the case. A party may take his writ of error from the highest court of the State when the decision is against the constitutional rights set up, or is against the federal statute under which he claims, or right which he claims under a treaty of the United States.

If, in the prosecution of a litigation in the State courts, that question arises, and the party does not get his rights conceded or allowed to him by the highest court of the State, he sues out his writ of error to the Supreme Court of the United States. But if there is a federal question, such as is presented in this case, and he comes directly to a federal court, and asserts that federal question, an appeal lies directly from the decision of this court to the Supreme Court of the United States on that question.

The Court has no doubt, therefore, that a federal question, and one of the most serious character, is presented in this bill. It entertains no doubt about its jurisdiction to award the relief asked, and it entertains no doubt whatever that, under the facts stated in this bill, the relief that is asked should be granted, and that the Council of the city of Cleveland should be enjoined from the enforcement of that ordinance on the case made by the bill. That will be the decree of this Court. That is the judgment, I mean, of this Court. The Court is therefore compelled to overrule this demurrer, and put the defendant to an answer, if it desires to answer. If the defendant does not desire to answer it may decline, and may take an appeal directly from this judgment of the Court to the Supreme Court of the United States, and have the whole subject fully reviewed. I would suggest to counsel, if they take this suggestion of the Court, that they carry the case directly from this decision to the Supreme Court of the United States, and let this important question be settled by the highest court in this land, and perhaps in any other.

The demurrer will be overruled, and if the defense enter of record that they decline to make further answer, of course, then the decree will go that the bill be sustained, and that the City Council of Cleveland be perpetually enjoined from the enforcement of the ordinance complained of.

The Working of Steel Castings.

In a recent article M. Louis Campredon makes some interesting remarks on the working of steel castings. When taken from the mould they require fettling and cleaning in the same way as ordinary castings, but the work is harder, especially as regards the removal of the gates, which for steel castings must be very large. Delay is often caused by the difficulty of removing these gates. As regards machining such castings, it should be noted that the outer layers are harder than the interior of the casting. This is partly due to the high temperature at which the steel is cast, causing vitrification of the walls of the mould, and making grains of the sand to adhere very firmly to the exterior of the casting. At the same time a sort of air tempering seems to occur, which still further increases the hardness of the outer layers. Such casting can be forged without difficulty, and the softer castings can be welded with ease. With harder castings a satisfactory weld is obtainable, if at all, only by great skill on the part of the workmen. In general, forging improves the quality of the metal, rendering it more ductile, as the following results show:

	Breaking Stress, Tons per Square Inch.	Elongation on 4 in. Per Cent.
Steel casting unannealed	49.8	5
	51.1	4
Steel casting forged	50.2	8
	50.9	9
Steel casting forged and annealed	50.6	13
	51.6	13.3

In forging ordinary steel castings having a strength of 28 to 38 tons per square inch, bad results are often obtained. These are usually due to working the steel at too high a temperature, viz., above a cherry red, or to the fact that only portions of the casting have been hammered, without subsequent annealing of the casting as a whole. When carefully done, however, there is no doubt that forging, particularly if followed by annealing, considerably improves the material. The temperature at which annealing is carried out should be proportioned to the hardness of the metal, and to the amount of forging it has undergone. For hard steels the temperature of annealing may be above cherry red, whilst with soft steel it should not exceed a yellow heat. For steels of intermediate hardness, temperatures between these two limits may be adopted.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

A FIRE occurred in the works of the Ohio Pipe Company, of Columbus, Ohio, on the evening of the 8th inst., but the good work of the Fire Department prevented serious damage. The loss was comparatively slight, and the operations of the Company were not interfered with in any respect. The fire is said to have been of an incendiary origin.

WE understand that a movement to establish a gas works at New Lisbon, Ohio, is underway. This place is the Capitol of Columbiana County, and has a population of less than 5,000.

MR. HENRY S. CHASE, formerly Superintendent of the Great Falls (N. H.) Gas Company, has accepted a responsible position in connection with one of the many important New York city enterprises of Mr. Erastus Wiman.

THE Cleveland (Ohio) authorities seem to be getting that proposed gas testing station of theirs in shape, and, at any rate, Prof. Hobbs is breaking in his tyro hand, in order that he may arrive by easy stages at the full dignity of his future post. The Professor recently tried to establish the actual pressure, by means of tests, at which gas is supplied in the city, and his results, of course, were printed in the daily newspapers. In gathering the figures that go to make up his statement, the Professor seems to have gone astray, as the following letter from Mr. G. A. Hyde, of the Cleveland Gas Light and Coke Company, to the editor of the *Leader*, goes to show: "The report of Prof. Hobbs, in reference to the pressure of the gas, conveys an erroneous impression which I would like to correct- He reports pressures taken at his laboratory as follows: November 6, at 6 o'clock, 2.15 inches; November 7, at 11 o'clock, 1.90 inches; November 8, at 6 o'clock, 2.25 inches. At the gas office at the same hours, the pressures were: 1.45 inches, 1.45 inches, and 1.85 inches. The inspector states that the pressure should not vary much from 1.60 inches. I can state positively that the average pressure during the ordinary burning hours does not exceed 1.60 inches either at the gas office or at my residence at the corner of Kennard and Sibley streets, where pressure registers are kept constantly, and I am confident that the average for the whole city, east of the river, is much less than that. The elevation of the laboratory, where Prof. Hobbs worked, is about 20 feet above the ordinary burners in this district, which increases the pressure about .20 inches. The laboratory is located at the corner of Erie and St. Clair streets, and at that point the gas is supplied through a 12 inch main, leading directly from a 24-inch main on Lake street, consequently the pressure would be above the average at that point, while the pressure at the gas office would be nearer the average. The pressure in the main supply pipes needs to be higher than the average, so as to supply the outlying districts with a pressure considerably below the average."

A CORRESPONDENT at Aurora, Ills., forwards the following: "When the Street Railway Company began the construction of their enormous power plant in Aurora, it was at once surmised that it was only a question of time when they would control the electric lighting of the city, as it was known that a plant of such dimensions was not required for operating the street railway. All speculations in that direction were soon quieted, however, by the purchase of the local electric lighting plants by the Aurora Gas Light Company. Now an arrangement has been entered into whereby the dynamos of the Aurora Gas and Electric Light Company will be moved into the power house of, and will be run by, the Electric Street Railway Company. The Gas Company now operates 7 dynamos, the last of which (a 750 lamp Thomson-Houston) was added for the purpose of lighting the new Opera House, for which work it will be exclusively employed. The Gas Company will at once dispose of its steam plant, and the Company claims that a large economy will be secured over its former plan of working."

MR. W. R. HUGHES, Special Auditor, of Toronto, Canada, charged with the task of examining, on behalf of the city, the accounts of the Consumers Gas Company, has presented his report. He, of course, believes that the Company has charged to capital account, repairs and depreciation larger sums than should be so placed, and having thus freed his mind, he gives further vent to the largeness of his views in the odd suggestion that the consumers of gas should be represented on the Board of Directors of the Company, either through the Mayor or some one appointed by the Council. Why does not the city buy sufficient stock to entitle it to representation on the Board in the regular way?

ON and after March 1st, 1892, the gas rate at Richmond, Va., will be $1.25 per 1,000 cubic feet, the Auditor having received instructions to make out the bills in accordance with that price.

THE Council Committee on Lights, of the Wheeling, W. Va., City Council, have recommended that the Edison Electric Light Company be not granted a franchise to lay conduits through the streets and engage in the business of commercial lighting. One reason for the refusal was that the main system of the city's gas works would be endangered.

A CORRESPONDENT writes that work on the Brookline Gas Light Company's plant at Brookline, Mass., is being vigorously prosecuted. The plant will be completed and ready for action early next spring.

WE are glad to say that Superintendent McLean, of the Southbridge (Mass.) Gas and Electric Light Company, is rapidly regaining the ground lost by him during his recent severe illness.

PRESIDENT GRISWOLD, of the East St. Louis (Ills.) Gas Company, has had piping times of late, partly brought about by the change in grade of the city's streets, many of which were raised several feet. He took occasion in making the changes to put in larger pipe, and now the mains are fairly ample for the demands made upon them. East St. Louis is growing so rapidly that Mr. Griswold has determined to enlarge the manufacturing plant to a capacity equal to 250,000 cubic feet per diem—the capacity of the present works is only 100,000 cubic feet. The estimated cost of this is $50,000.

THE incandescent plant recently added to the arc lighting annex of the Salinas (Cal.) Gas and Water Company is said to equal the expectations of the residents.

GLASGOW, Kentucky, is said to be anxiously awaiting the advent of capitalists that will put their money in a gas-electric company at that point.

A CORRESPONDENT at Topeka, Kansas, writing under date of the 12th inst., says: "The question of lighting the city of Pittsburg, Kansas, was solved by a syndicate of prominent citizens, but subsequently the entire investment came into the control of Mr. Oliver T. Boaz, who has

added many thousands of dollars to the sum first invested, by way of enlarging the capacity of the works, etc. The ground occupied by his plant comprises about two acres, and is located near the center of the city and adjoining the railroad. The daily product of gas is now 100,000 cubic feet, and the rates range from $1 to $1.50 per 1,000. At the time that the erection of the gas works was first proposed, it was estimated that $12,000 would be sufficient to equip them, but in reality $80,000 has been put into the enterprise. The net result, however, is that Pittsburg has as good a gas plant as it is possible to maintain. Mr. Boaz should have all the credit for this."

THE Van Gestel Incandescent Lamp Company seems to be on the verge of dissolution. Mr. Van Gestel was the owner of United States patent No. 413,636, for an improved tubular electric lamp, and an applicant for improvements to the same on April 18, 1891. He had also discovered a secret process for producing an alloy for manufacturing a filament for incandescent electric lamps; but as he did not have the capital to make his discoveries and inventions profitable, he entered into an agreement with John M. Houghton, George O. Keeler, Moses L. Stern, and the Denver Consolidated Electric Company. They were to furnish capital to the extent of $5,000 to establish a plant, and he was to devote his whole time to the business of manufacturing lamps and sockets on the principle of his discoveries. The business was at first to be conducted by a syndicate, composed of the parties to the contract, but after the plant got into good working order, having a capacity of 200 lamps a day, all of the standard of excellency of the lamps of the Consolidated Electric Company, a corporation with a capital of $200,000, was to be formed. Then Mr. Van Gestel was to reveal his great secret for producing the subtle alloy, and the secret, couched in terms intelligible to a chemist and electrician, was to be a part of the assets of the corporation. There was also a provision which declared that, in case the business proved a failure, the secret was to become again the property exclusive of Mr. Van Gestel, and the other assets were to revert to the other members of the Company. It is this provision of the contract that the moneyed members of the Van Gestel Incandescent Lamp Company are pleading in a complaint in the District Court. They aver that the corporation has been formed, but that the magic secret for producing the alloy is still locked in the breast of Mr. Van Gestel. Moreover, they allege that the manufactured product was not marketable because of inherent defects, and that all the money they paid in, and more, has been spent. The Board of Directors held meetings Nov. 7 and Nov. 9 last, and voted the enterprise a failure and ordered papers of dissolution drawn up as per the contract forming the syndicate. They allege that Mr. Van Gestel and H. Van F. Furman, who is joined as defendant, refused to accept the terms, and they therefore apply for a receiver and ask that the business of the Company be wound up.

IN the first half of the current year the quantity of coal mined in Belgium amounted to 9,094,389 tons. The imports of coal into Belgium in the same period were 789,971 tons, while those of coke were 60,705 tons —equivalent to 80,940 tons of coal—making an aggregate of 9,965,300 tons. The stocks of coal on hand in Belgium at the close of the half year were estimated at 481,945 tons. The exports of coal from Belgium, in the first half of this year, were 2,074,946 tons, while those of coke were 482,418 tons, equivalent to 643,759 tons of coal. These deductions, taken together, amount to 3,200,648 tons, leaving the consumption of coal in Belgium, in the first half of this year, at 6,764,652 tons.

THE Toledo *Blade*, of the 14th inst., contains the following: "The Gas Committee has finally taken action on the ordinance fixing the price of illuminating gas, which was once before recommended to the Council with a vote of $1 per 1,000 cubic feet, and was immediately relegated to the Committee again by the Board of Aldermen. This time the Committee has acted with great deliberation, having taken several months to fully consider the matter. Two weeks ago Messrs. Macomber, Potter, Morris, Allbright and Dover were appointed a sub-committee to examine the books of the Gas Company, and then to recommend a price which would be fair both to the Company and the citizens. Messrs. Wallbridge and Faben, of the Company, agreed to give the sub-committee full swing at the books and free access to all their accounts. For two weeks Messrs. Potter and Macomber particularly have devoted a great deal of time to the records of the Gas Company, and came to the Committee meeting last night well primed with facts and figures in connection with the illuminating gas business. Promptly at 7:15, Chairman Everett called the Committee to order. Every member was present—Messrs. Potter, Macomber, Morris, Dover, Allbright, Walker, Caldwell and the Chairman—and Messrs. Wallbridge and Faben, representing the Company, were also in attendance. Other routine business having been disposed of, Chairman Everett called up the illuminating gas question. 'We are ready,' said he, 'to hear the report of the sub-committee appointed to examine the books.' Mr. Potter moved that the matter be discussed in executive session, which motion was carried, and the Committee retired to the private office of the City Clerk and there remained for nearly two hours. During this time everything that transpired was secret, but excited discussions could be heard from the outside, and the impassioned eloquence of Potter and Caldwell came through the doors and vibrated through the halls of the almost empty Council chamber. After 10 o'clock the doors were opened and Chairman Everett appeared. 'We would like to ask Messrs. Wallbridge and Faben a few questions about their books. The Committee,' said Mr. Everett, 'finds some difficulty in determining what was done with some $36,000, which are apparent profits, and at the same time are not charged in the amount which is made into dividends on the stock. Perhaps there is an account on the debit side which will offset this, but the Committee cannot find it. We would also like to inquire what entry had been made to the money on hand with the depreciation fund.' 'Of the amount to which you referred,' said Mr. Faben, '$26,000 was expended in the laying of new mains.' 'But,' said Mr. Macomber, 'you increased your stock to cover the cost of the new mains and the repair of the old.' 'We increased our stock $12,000, whereas we expended $38,000 on the improvements referred to,' replied Mr. Faben. Mr. Macomber remarked he thought that was a very large sum to expend on repairs, etc., which elicited the rejoinder from Mr. Wallbridge, 'not at all; why, in the rolling mills we have recently spent $18,000 on a single item—that of putting in new boilers. The sum is not more than has been expended in other years, and we can easily furnish you statements to show what has been spent.' 'It seems you are rather behindhand with your statements,' said Mr. Macomber. 'Why were we not furnished with them when we were examining your accounts?' 'The City Council investigating the accounts of a private corporation is so unusual that we did not at the time make an itemized statement of our expenditures for years past,' said Mr. Wallbridge; 'but we might have done it had you asked for it.' The discussion of the matter lasted until nearly midnight. Finally, Mr. Macomber moved to fix the price at $1.10, but that was voted down. Councilman Morris then moved to fix the rate at $1.20 for city buildings, and $1.35 for private consumers, with a rebate of 15 cents per 1,000, for prompt payment. This was agreed to, and the schedule practically amounts to a reduction of 5 cents per 1,000. 'I wish to remind you,' said Mr. Macomber, to the representatives of the Gas Company, 'that this new ordinance requires you to supply gas of 22 candle power instead of 18 candle power, as heretofore stated.' 'We will carefully fulfill that section of the ordinance,' said Mr. Faben, and the Committee quickly adjourned, having been in session nearly 5 hours."

MESSRS. HOADLEY, LAUTERBACH & JOHNSON, as counsel for James Langan, who holds 152 shares of stock in the Union Gas Light Company, of the 26th Ward, Brooklyn, N. Y., applied to Chief Judge Clement, at Special Term of the Brooklyn City Court, on the 13th inst., to continue a preliminary injunction restraining the Directors of the Company from carrying out a plan of consolidation with the Citizens Gas Light Company. Mr. Langan claims that the Company refuses to transfer the stock on its books to him. The Union Company was organized with a capital of $250,000. The plaintiff alleges that on October 21st, last, he became the *bona fide* purchaser of 152 shares, and made a demand on the Company to transfer his stock on the books and to issue to him a proper certificate. The Company and its officers refused to do so, as he says, in order to prevent him from being present and voting on the stock at a meeting to discuss the consolidation project, held on November 9th. The plaintiff alleges that the Union Directors own a controlling interest in the stock of both Companies, and that they are illegally seeking to dispose of $500,000 mortgage bonds of the Company. He also alleges that he has been denied access to the books of the corporation. He asked for an injunction restraining the Union Company from consolidating with the Citizens Company, and that the issue of $500,000 in bonds be declared illegal. After listening to exhaustive arguments, Judge Clement continued the injunction, modifying it so as to permit the stockholders to hold the meeting advertised for November 23. They cannot carry out the plan to consolidate, but may adjourn until after the trial, which was set down for the first Monday of December.

THE Board of Directors of the Union Gas Company is as follows: Charles J. Francklyn, W. F. Van Pelt, C. Leslie Morgan, H. H. Adams, Henry Mactier, Samuel J. Young and Miles A. Brown.

EDGAR M. ROWE has instituted a suit against the Citizens Electric Light Company, of Louisville, asking for damages in the sum of $1,000. The plaintiff, who was in the employ of Herman Straus, says that while turning off the electric lights in the premises of his employer, he received a severe shock because of the incomplete condition of the lighting apparatus of the defendant. His injuries were so serious that he was unable to remain in the service of his former employer.

ACCORDING to the completed assessment rolls for purposes of taxation in Hamilton county, O., the valuation of the property of the Cincinnati Gas Light and Coke Company is returned at the following: Total valuation, $2,463,263, of which $2,331,481 is represented by property in the city of Cincinnati, the balance being located in other portions of the county.

AT the annual meeting of the Rockville (Conn.) Gas and Electric Light Company the following Directors were re-elected: Messrs. George Sykes, S. G. Risley, George Talcott, H. L. James and J. N. Stickney. The Directors subsequently named the following officers: President, George Sykes; Secretary and Treasurer, J. N. Stickney.

THE offices of the Adams (Mass.) Gas Light Company have been removed to the Greylock Bank building.

THE Electric Gas Lighting Company, of Boston, through Attorney Horace Pettit, has filed a bill in the United States Circuit Court, district of Philadelphia, asking that John G. Parke, whose place of business is at 327 North 26th street, be enjoined from manufacturing and selling electrical gas light burners. Petitioners ask for the injunction on the ground that they own and control the United States letters patent on the electrical gas appliance, and that they have, therefore, the sole right to manufacture and sell the same.

FRANK S. LEARNED has sued out an attachment against the Gardner (Mass.) Gas Light Company. The claim amounts to $1,000.

THE Exeter (N. H.) Gas Company has succeeded in convincing the proprietors of the large shoe manufacturing concern, recently located in the city, that gas is to be the light of the future. The gas men, however, had to put in a goodly stretch of 3-inch main before the shoe folks saw the point of the argument.

SOME time ago we noted that Mayor Rich, of Mobile, Ala., was hotly in favor of the city installing and operating an electric lighting plant, and that to bring the temperature of his colleagues up to the state of his own, he had gathered information from other cities engaged in municipal lighting, respecting the cost to them of each light, and so on. Among those who replied to Mayor Rich's appeal was Mr. W. H. Hinkle, Superintendent of the Little Rock (Ark.) City Electric Light Plant, and his figures* of cost for arc lighting are so absurd that we beg leave to place them before our readers, so that they may amuse themselves in filling in the charges that Mr. Hinkle forgets to mention—such, for instance, as allowance for rentals, water supply, interest charges, depreciation, renewals, etc., etc. Mr. Hinkle says: "Little Rock, Ark., Sept. 27, 1890.—Gentlemen:—I herewith submit my report of the running expenses for the second year's running of the city electric light plant. We now have 5 dynamos and about 28 miles of wire, with 112 lamps. The schedule time called for 2,070 hours running time, while the plant was run 2,624 hours, making 554 hours overtime, which is equal to two months extra work, and here give a detailed statement of expenses of the plant, from September 1, 1889, to September 1, 1890:

Pay roll	$3,340.00
Coal	1,340.00
Carbons	486.90
Oil	120.78
Armature repairs	285.08
Insurance on plant and boilers	185.00
Miscellaneous repairs	50.17
Shoeing horse	15.00
Feed for horse	74.10
Globes for lamps	27.25
Waste	26.97
Repairs on roof of plant	15.00
Painting stack and repairing boiler well	20.00
Total	$5,986.25

"Now divide $5,986.25 by 365 and we get the cost of running the plant for each night, which is $16.40. Now, divide $16.40 by the number of lamps (112) and we get the cost per night of each lamp, which is a fraction over 14 cents per night. Now multiply the cost per night by 365 and we get the cost of each lamp per year, of an average run of 8 hours per night, which is $23.51. I wish here to call your attention to the fact that the number of hours here given is the number of hours the lights were on, not the time taken in getting up steam and shutting down, etc., and cleaning up the plant. We take note of the time it is when the lights are turned on and when they are turned of. You will see from this that the expense of running the plant for the second year is $1,093.01 less than the first year's expense, which was $7,079.86."

* Mr. Hinkle forwarded a copy of his report to his superiors for the year ended Sept. 1, 1890.

SUPERINTENDENT PARKER, of the Bangor (Me.) Gas Company, has been busily at work putting gas services into houses in that city that hitherto knew not what gas was—so far as the illumination of their interiors is concerned. As Bangor is not a very large place, it goes without saying that 20 additional meters ought to be so many feathers in the cap of the "Super.," and that they will exert an appreciable effect on the send-out is also a surety.

MR. J. E. LEADLEY, formerly in charge of the plant erected by the Philadelphia Gas Improvement Company, at Philadelphia, has been appointed Chief Engineer to the Archer Fuel Gas and Engineering Company. The home offices of the Archer Company are in this city.

THE water power equipment of the Augusta (Me.) Electric Light Company was a dead letter on the night of the 15th. Cause, low water in the Kennebec river; effect, eclipse of the public arc lights; result, much confusion.

THE new electric lighting station of the Citizens Gas Company, of Willimantic, Conn., was "dedicated" in a novel manner on the night of the 12th inst. The "invitation" took the form of a hop, a general invitation to participate in which was issued to the residents by the officers of the Company. About 2,000 responded to the invitation, and the belles and the beaux tripped it lightly until midnight. A feature of the affair was a lunch, which was prepared by the aid of four Success gas stoves. General Boss, President of the Company, assisted by Manager Pinney, received the guests. Everybody was pleased, and the Company was well advertised.

AT a regular meeting of the Library Board, Minneapolis, Minn., one of the subjects discussed was the relative cost of gas and electricity for the lighting of the buildings. Positive evidence having been produced that the present cost of lighting the buildings by incandescent electric lamps was twice as great as when gas was used, it was decided to substitute the latter for the former at once.

The Florence Oil Fields, Colorado.

At the last meeting of the American Institute of Mining Engineers, Mr. George H. Eldridge, of the U. S. Geological Survey, read an interesting paper, descriptive of the Florence Oil Fields, the petroleum product of which is largely consumed in Colorado. It was the first published treatise on the geology of the district, and according to Mr. Eldridge, the oil-bearing zone occurs in the lowest strata of the Montana group of cretaceous rocks, which is here about 4,000 feet thick, and is known as the Pierre formation. The strata in this field form a synclinal or basin, on one side of which all the productive wells so far opened have been located. The developments have so far been confined to the neighborhood of Florence, and all wells are located within a radius of three miles from the town, and the most productive wells are in the town limits. The field is estimated to be about 14 miles long and 8 miles wide, and as the rocks have been but slightly faulted, if at all, prospecting operations are easy and simple. The oil zone occupies about 1,900 feet in the Pierre formation and the most productive wells are about 1,150 feet below its top, or 2,000 feet below the surface. Below this there is about 550 feet of barren ground, and then more oil is found. There is about 350 feet more of barren ground, and below this, at the bottom of the zone, small quantities of oil are found. The wells yield from 5 to 250 barrels per day, and 57½ per cent. of all the wells bored have proven productive. During 1890 the average daily yield of the district was about 1,200 barrels per day.

In the discussion of this paper, Mr. Newell stated that the conclusions of scientific men concerning the prospecting of petroleum fields have always been ignored by practical men, and the result has been that by blind prospecting, oil has been found in localities most unpromising, and where, according to geological rules, it should not have occurred. He further stated that the results obtained by the development of the Florence field were such as to render impossible the deduction of trustworthy conclusions on the subject.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

November 23.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	99¼	100
Central	500,000	50	--	90
" Scrip	220,000	—	95	100
Equitable	4,000,000	100	122	125
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	120	122
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	40	45
Preferred	5,000,000	100	—	82
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	109	115
Citizens	1,200,000	20	—	83
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	118	122
" Bonds	300,000		102	—
Peoples	1,000,000	10	68	72
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	97	100
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	127	135
" Ctfs	700,000	1000	100	—
Williamsburgh	1,000,000	50	110	—
" Bonds	1,000,000	—	106	—
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	84	86
2d " " "	3,000,000	1000	70	74
Bay State Gas Co.—				
Stock	5,000,000	50	47	49
Income Bonds	2,000,000	1000	98	102
Buffalo Mutual, N. Y.	750,000	100	105	110
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds	45,000	—	—	—
Chicago Gas Company	25,000,000	100	60⅝	60¾
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	82	82½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	97½
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	100
2d "	2,500,000	1000	94	94½
Consumers Gas Light Co., Jersey City	2,000,000	100	12	15
Bonds	600,000	1000	70	75
Cincinnati G. & C. Co.	7,000,000	100	—	200
Consumers Toronto	1,000,000	50	169	172
Central, S. F., Cal.			90	—
Capital, Sacramento, Cal			58	
Consolidated, Balt.	11,000,000	100	43½	44
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	110
Bonds	250,000		—	—
East River Gas Co., Long Island City	1,000,000	100	100	105
Bonds	500,000	100	100	102
Hartford, Conn	750,000	25	120	128
Jersey City	750,000	20	180	200
Louisville, Ky	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Laclede Gas Light Co., St. Louis, Mo.—				
Common Stock	7,500,000	100	19¾	20
Preferred "	2,500,000	100	—	—
Bonds	9,034,400	1000	77½	78
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	40	—
" Bonds.	240,000	100	103	—
New Haven, Conn		25	200	—
Oakland, Cal			34¾	35¼
Peoples, Jersey City		—	115	125
" " Bonds			—	—
Paterson, N. J.		25	99	102

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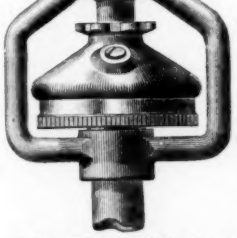

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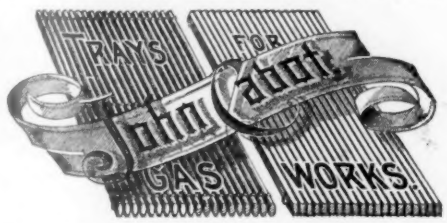

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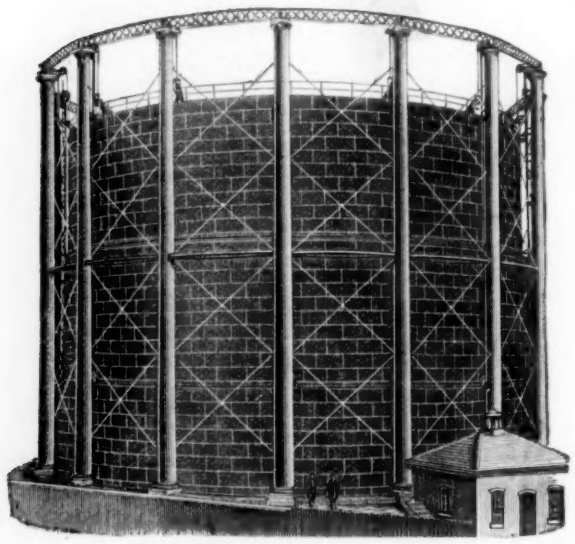

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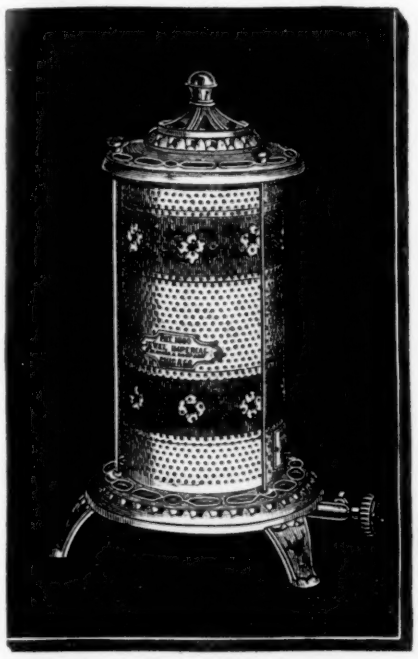

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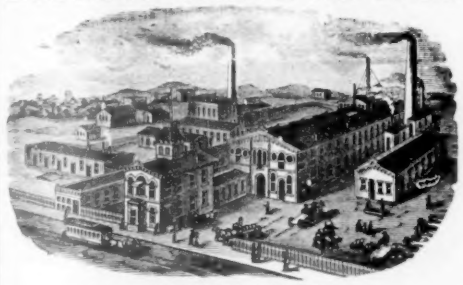

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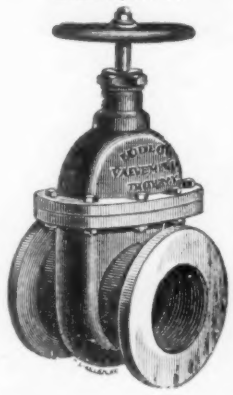

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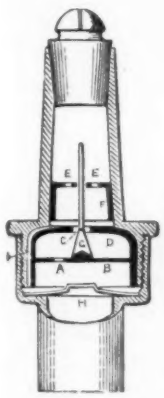

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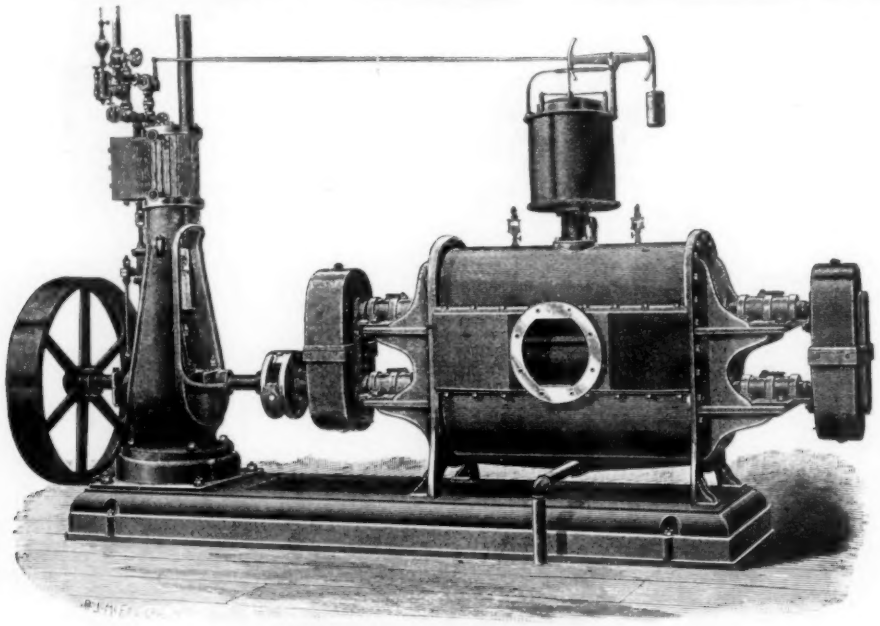

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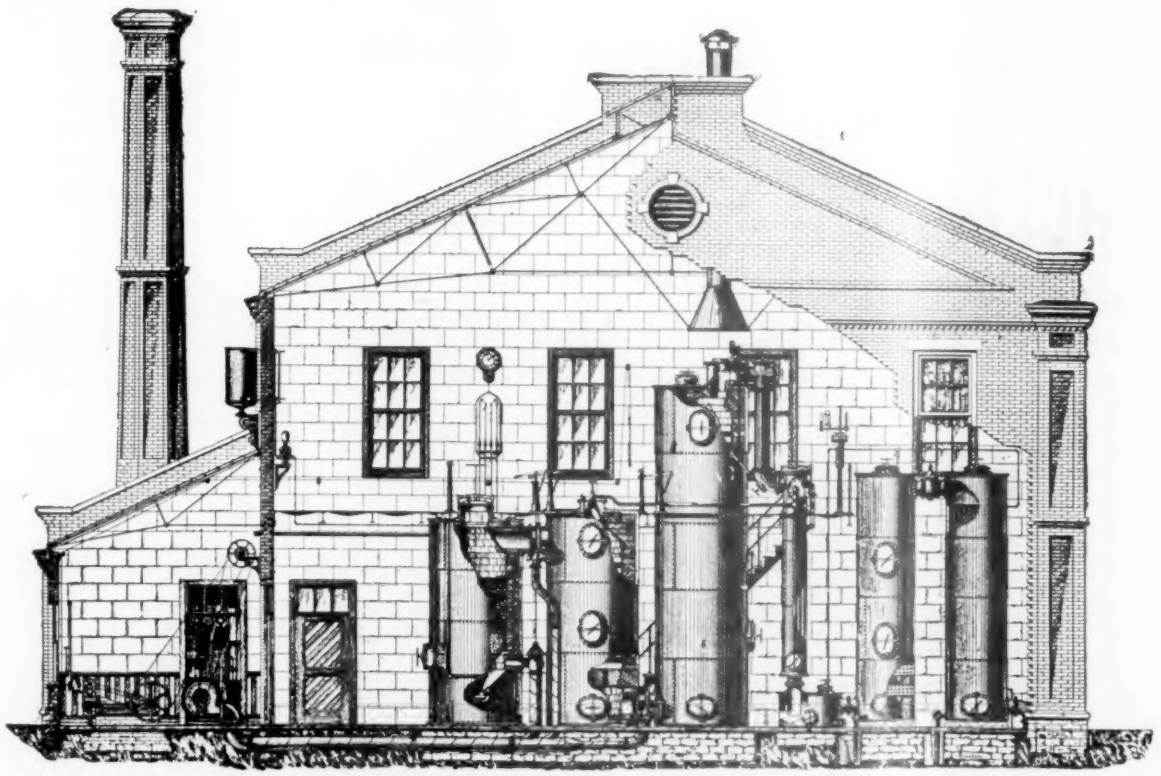

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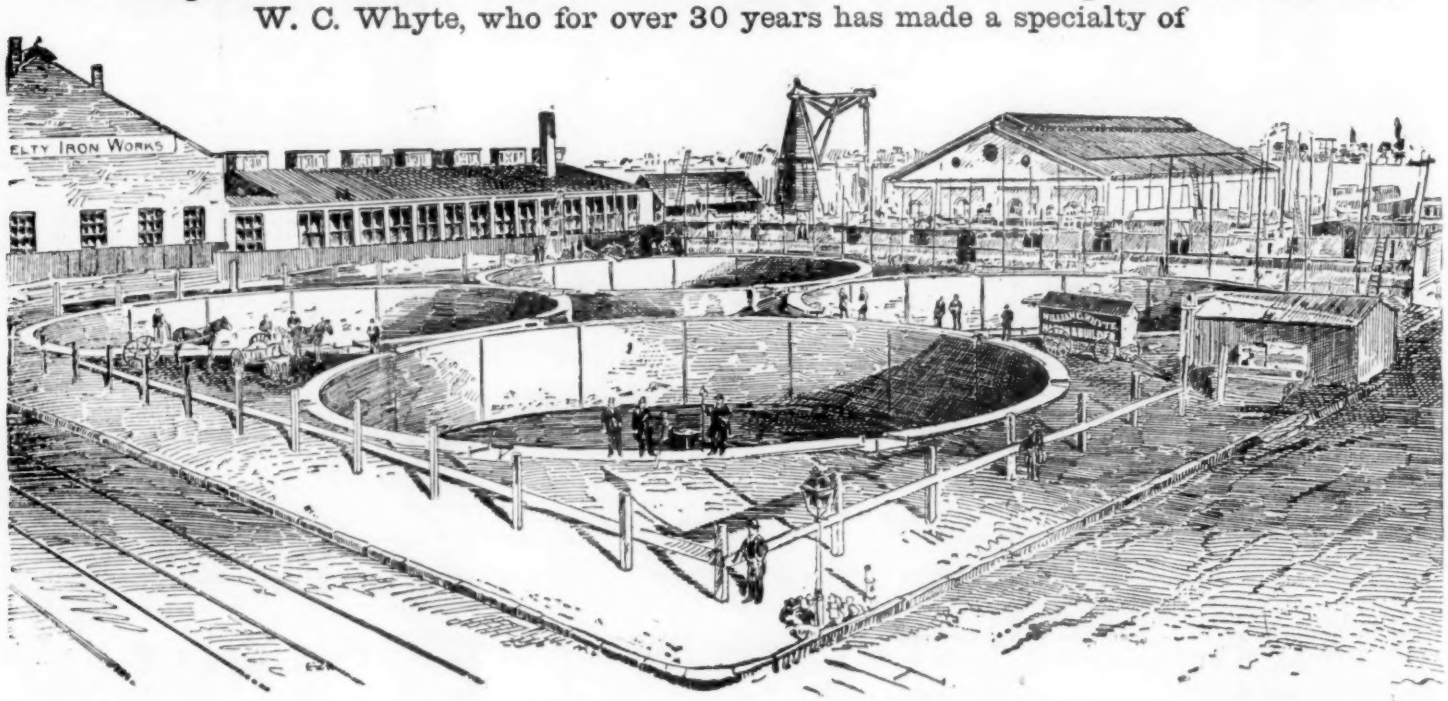

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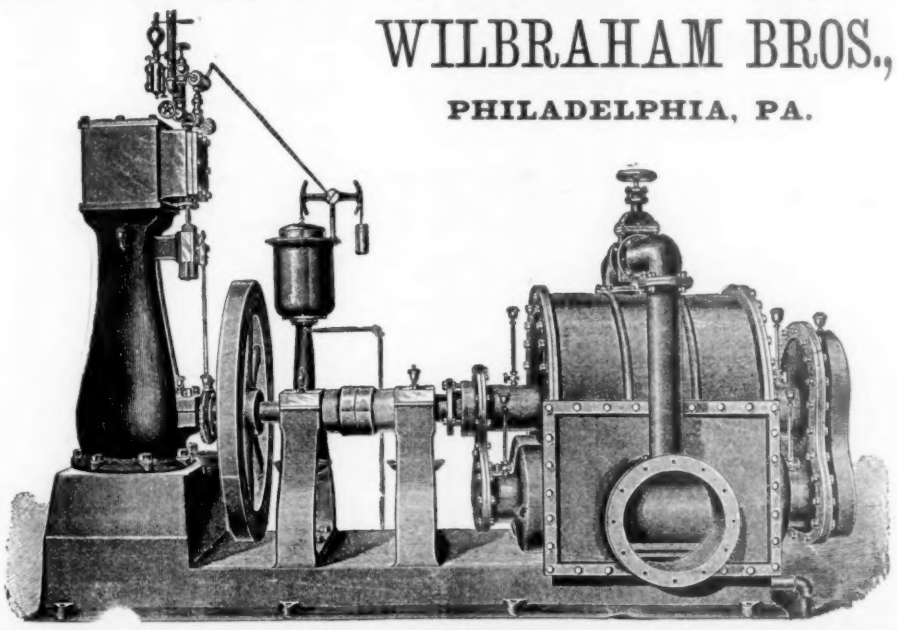

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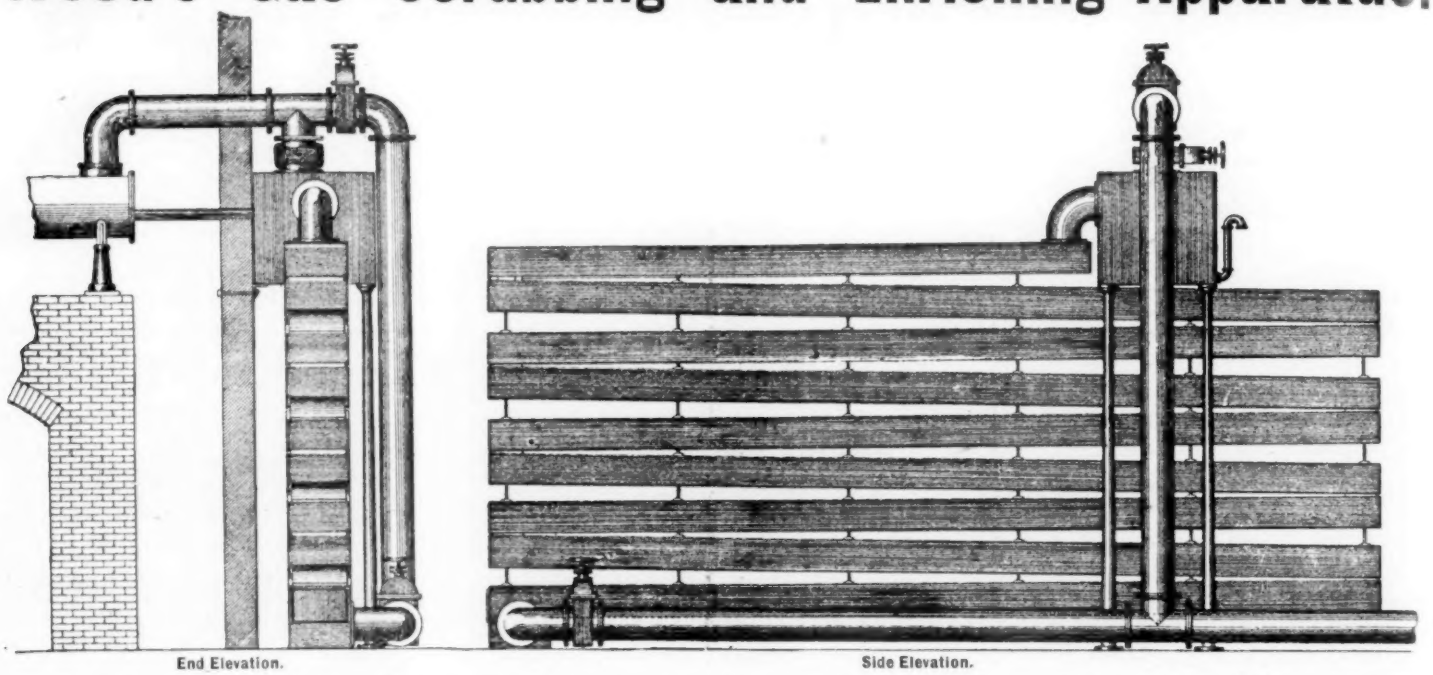

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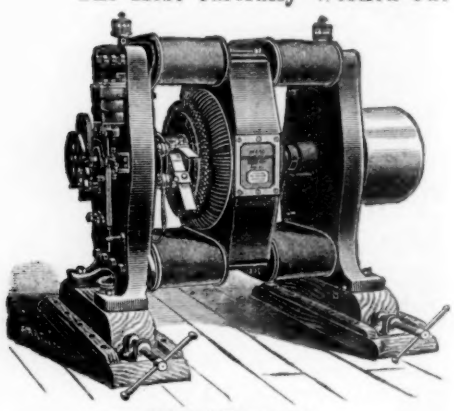

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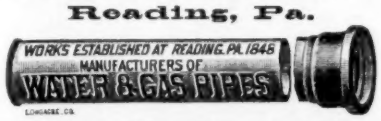

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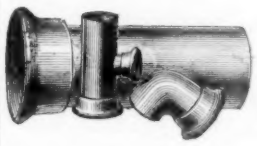

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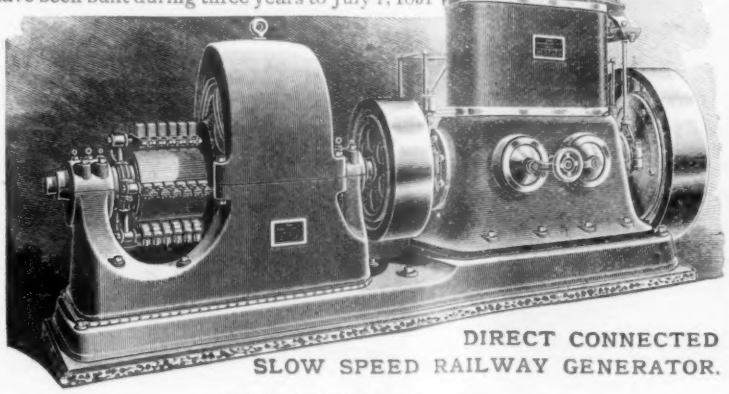

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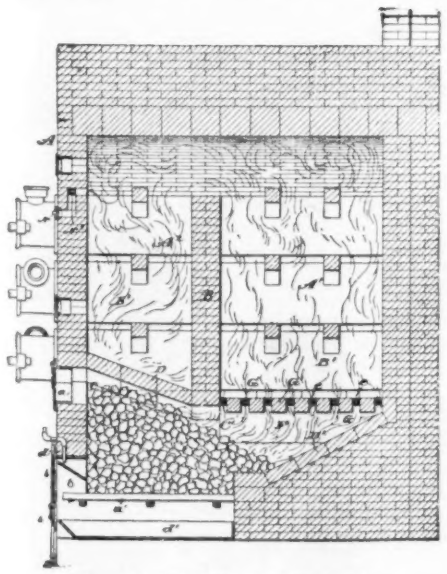

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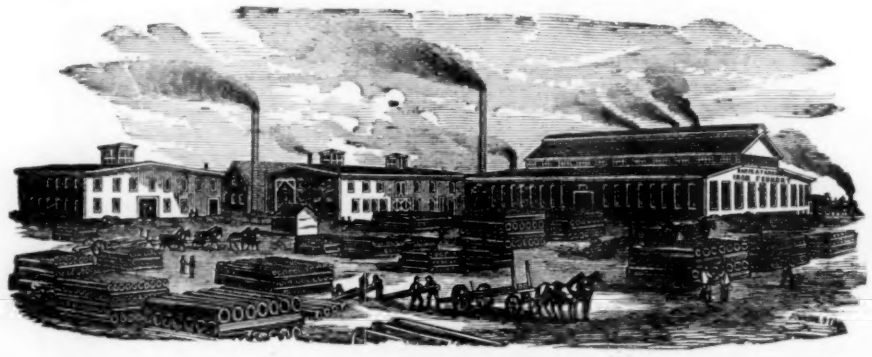

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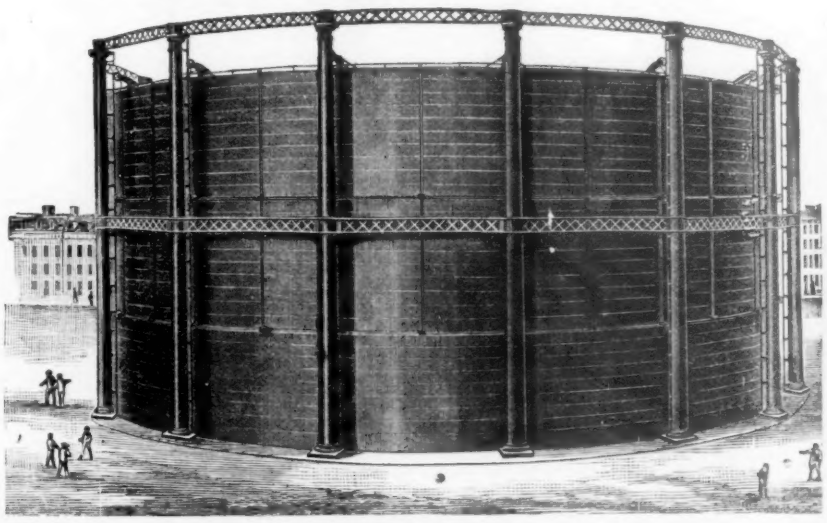

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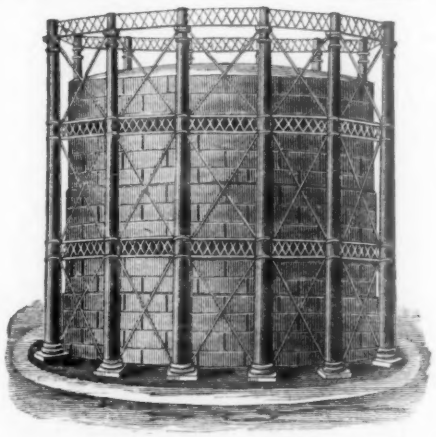

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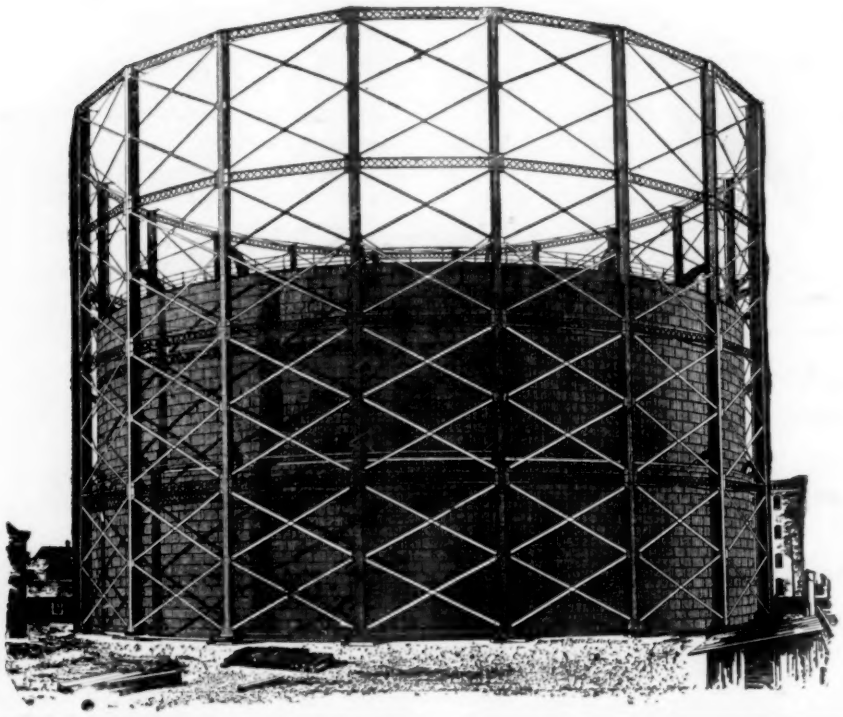

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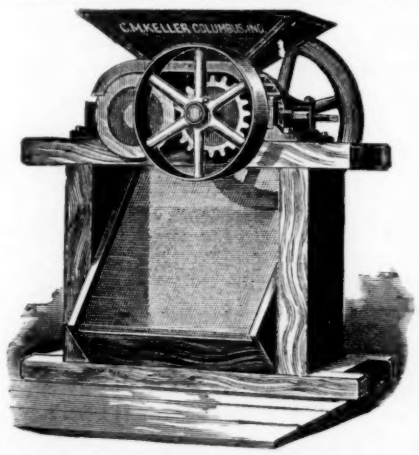

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